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**Final
Report No. 1**

March 1984

**An Archeological Overview and
Management Plan for the
Tooele Army Depot**

Under Contract CX-0001-2-0048
with the

**National Park Service
U.S. Department of the Interior**
Denver, Colorado 80225

for the
**U.S. Army Materiel Development and
Readiness Command**

by
Stearns-Floger Services, Inc.

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REPORT DOCUMENTATION PAGE		1. REPORT NO.	2.	3. Recipient's Accession No. AD-A142 360
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3. Supplementary Notes This report was prepared as part of the DARCOM Historical/Archeological survey on inter-agency technical services program to develop facility-specific archeological overviews and management plans for the U.S. Army Materiel Development and Readiness Command (DARCOM)				
4. Abstract (Limit: 200 words) The Tooele Army Depot (TAD) located in Tooele County, Utah, is an installation of the U.S. Army's Materiel Development and Readiness Command (DARCOM). As stewards of approximately 44,096 acres (17,846 hectares) at TAD the U.S. Army has responsibility for the Management of any cultural resources located there. Three sites are known to exist on TAD, but local geomorphology and cultural history suggest that additional cultural resources are likely to be found in undisturbed portions of the TAD. Those sites possessing physical integrity will have high research value. In compliance with Draft Army Regulation (AR 420.XX) and in consideration of future general disturbance activities, the following recommendations are made: (1) conduct a field survey of all undisturbed areas on the installation to identify unknown cultural resource locations, (2) establish monitoring program in those areas on the installation where construction and subsurface disturbances are planned, (3) evaluate and nominate known cultural properties for inclusion in the National Register of Historic Places (NRHP). (4) take action to preserve properties eligible for inclusion in the NRHP. These recommendations, if implemented, together with historic architectural information would then serve as the basis for developing an installation Historic Preservation Plan.				
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MANAGEMENT SUMMARY

The Tooele Army Depot (TAD), North and South Posts, located in Tooele County, Utah, is an installation of the U.S. Army's Materiel Development and Readiness Command (DARCOM). As steward of approximately 44,096 acres (17,846 hectares) at TAD the U.S. Army has responsibility for the management of any cultural resources located there.

Three sites are known to exist on the Depot (North and South Posts) but local geomorphology and culture history suggest that additional cultural resources are likely to be present on the undisturbed portions of the Depot.

Those sites possessing physical integrity will have high research values. In compliance with draft Army Regulation AR 420XX and with consideration of future planned disturbance activities, the following recommendations are made:

- 1) Establish a field survey and monitoring program in those areas of the installations where construction and subsurface disturbances will take place.
- 2) Take action to record, document, and preserve those sites known to exist on the depot.
- 3) Systematically survey the buffer and grazing areas on the periphery of the Depot.

These recommendations, if implemented together with historic architectural information, would then serve as the basis for developing a Tooele Army Depot Historic Preservation Plan.

PREPARERS AND QUALIFICATIONS

Dr. J. Grady, principal investigator, has 21 years' experience in archeology, has participated in eight excavations, and has over 30 years of experience in aerial photography and aerial photographic interpretation. His doctoral dissertation, published by the Bureau of Land Management (BLM) (1980), dealt with highland/lowland adaptation of prehistoric peoples in the Piceance Basin portion of the Colorado Plateau in northwest Colorado. His research interests include the solution of large-scale (areal) archeological problems using ecological modeling, statistical sampling, and sampling strategies and modeling; remote sensing and aerial photographic interpretation; and development and use of statistical techniques to integrate prehistoric spatial distributions into reconstructions of viable economic patterns. He was responsible for the Prehistoric Overview, Section 2.2.1, Archeological Research Directions, Section 2.3, Chapters 3.0, 4.0, 5.0, and 7.0, and the Management Summary of this report.

Ms. B.J. LeFree has had extensive archeological and compliance experience in Colorado as Head of Compliance for both the State Archeologist and the Colorado State Historic Preservation Officer (SHPO). She also was a staff archeologist for the Advisory Council on Historic Preservation (ACHP). Ms. LeFree has studied many Native American people extensively, particularly those at the Pueblo of Santa Clara, where she worked with several potters in writing her book, Santa Clara Pottery Today. Ms. LeFree was archeological laboratory supervisor for University of Denver, responsible for analyzing lithic and pottery artifacts, writing site descriptions, developing statements of significance for eligible properties, and writing reports. She currently is employed at Stearns-Roger as the Cultural Resource Manager and Archeologist. She wrote the Ethnography, Section 2.2.2, and developed the Recommended Archeological Management Plan, Chapter 6.0.

Dr. S.F. Mehls, Stearns-Roger staff historian and designated Historical Investigator for this project, has extensive academic and professional experience in the history of the American West. He has more than three years' full-time experience as a historian for cultural resources projects. Dr. Mehls has published several books, articles, book reviews, and government documents, and has given numerous oral presentations. While employed by the BLM, he received two individual special achievement awards for the quality and timeliness of his historical cultural resources work. He was responsible for writing the Historical Overview, Section 2.2.3, and contributed to Research Directions, Section 2.3, and Historic and Recent Land Use Patterns, Section 3.2.

Mr. J.L. Dawson is an ecologist specializing in terrestrial ecology and botany. He has produced baseline descriptions and environmental assessments for numerous industrial projects, including oil shale and synfuel developments, power plants, mines, and transmission and pipeline corridors. His responsibilities have included review of relevant literature, design and performance of necessary field studies, description of baseline conditions, and analysis of impacts. He has broad geographic experience with work on projects in many of the western states and in North Dakota and West Virginia. He was responsible for compiling the data for the Physical Environmental Overview, Section 2.1.

Mr. D.E. Plume, staff geologist for Stearns-Roger, has for the past 12 years been involved in field and laboratory work for preparation of archeological and geological studies throughout North America. In addition, he has contributed to several studies on the environmental effects of high-level nuclear waste storage, hazardous waste management legislation, and computer applications of numerical simulation. Mr. Plume was responsible for compiling the data for the geology and paleoenvironment portions of the Physical Environmental Overview, Section 2.1.

ACKNOWLEDGEMENTS

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We are especially grateful for the assistance and cooperation of Larry Fisher, Environmental Officer at Tooele, for scheduling our trip; Robert Marshall, who delivered maps, environmental reports, and management plans; Mason Walker, who drove us over both North and South installations and took us to two archeological sites; Dave Maxfield, who consulted with us at the Tooele Army Depot Railroad (AD-RR) Maintenance Facility; Dave Madsen, State Archeologist, and his staff, for site forms pertinent to the study region; and Rich Fike, Bureau of Land Management (BLM) Archeologist, and Doug Dodge, Salt Lake City District BLM Archeologist, for maps, unpublished reports, and site forms.

Our special appreciation is extended to Jack Rudy, Contracting Officer's Representative, and Joe Bolin, Contract Officer, National Park Service Rocky Mountain Region, who accompanied us to the installations in Utah. We also extend our appreciation to Yvonne Stewart and John Thomas, Washington, National Park Service.

CONTENTS

	<u>Page</u>
NTIS FORM	i
MANAGEMENT SUMMARY	ii
PREPARERS AND QUALIFICATIONS	iii
ACKNOWLEDGEMENTS	v
CONTENTS	vi
LIST OF FIGURES	vii
LIST OF TABLES	x
LIST OF ACRONYMS	xi
FOREWARD	xii
 1.0 INTRODUCTION	 1-1
1.1 Purpose and Need	1-1
1.1.1 Federal Mandates	1-1
1.1.2 Native American Indian Legislation	1-3
1.2 The Tooele Army Depot	1-3
1.2.1 North Post Land Use	1-4
1.2.2 South Post Land Use	1-10
1.2.3 Contaminated Areas	1-14
1.2.4 Tooele Army Depot Railroad (AD-RR) Maintenance Facility	1-14
1.3 Summary of Previous Archeological Work Conducted on the Tooele Army Depot	1-14
1.4 The Sociocultural Context of the Archeological Resources on the Tooele Army Depot	1-16
 2.0 AN OVERVIEW OF THE CULTURAL AND RELEVANT NATURAL HISTORY OF THE TOOELE ARMY DEPOT	 2-1
2.1 The Physical Environment	2-1
2.1.1 Earth Resources	2-1
2.1.2 Water Resources	2-4
2.1.3 Modern Climate	2-4
2.1.4 Plant Resources	2-5
2.1.5 Animal Resources	2-7
2.1.6 Paleoenvironment	2-7
2.2 The Cultural Environment	2-11
2.2.1 Prehistory	2-11
2.2.2 Gosiute and Western Shoshoni Ethnography	2-19
2.2.3 History	2-29
2.3 Archeological Research Directions	2-43
2.3.1 Regional Concerns	2-43
2.3.2 Installation-Specific Archeological Research Directions	2-44

CONTENTS (Continued)

	<u>Page</u>
3.0 AN ASSESSMENT OF ARCHEOLOGICAL RESOURCE PRESERVATION AND SURVEY ADEQUACY	3-1
3.1 Environmental Constraints to Site Preservation	3-1
3.2 Historic and Recent Land Use Patterns	3-1
3.3 Previous Cultural Resource Investigations: Coverage and Intensity	3-1
3.4 Summary Assessment of Data Adequacy, Gaps	3-1
4.0 KNOWN ARCHEOLOGICAL RESOURCES ON THE TOOELE ARMY DEPOT DEPOT (NORTH AND SOUTH)	4-1
5.0 AN ASSESSMENT OF THE SIGNIFICANCE OF THE ARCHEOLOGICAL RESOURCE BASE TOOELE ARMY DEPOT	5-1
5.1 The Significant Resource Base	5-2
5.2 Ideal Goals and Objectives	5-5
6.0 A RECOMMENDED ARCHEOLOGICAL MANAGEMENT PLAN FOR TOOELE ARMY DEPOT	6-1
6.1 Facility Master Plan	6-1
6.1.1 Proposed Activities - North Post	6-1
6.1.2 Proposed Activities - South Post	6-9
6.2 Appropriate Goals	6-9
6.2.1 General Facility Planning	6-9
6.2.2 Project-Specific Resource Protection or Treatment Options	6-11
6.2.3 A Summary of Recommended Management Directions and Priorities for Effective Compliance and Program Development	6-15
6.3 Estimate of Scopes of Work and Cost Levels for Presently Identifiable Management Needs	6-19
6.3.1 Recommendation I	6-19
6.3.2 Recommendation II	6-21
6.3.3 Recommendation III	6-21
6.3.4 Recommendation IV	6-22
7.0 SUMMARY	7-1
8.0 BIBLIOGRAPHY	8-1
APPENDIX A Classification Methods for Site and Landform Types	A-1
APPENDIX B Locational Data, Known and Potential Archeological Resources on Tooele Army Depot	B-1
SUPPLEMENT An Archeological Overview for the Tooele Army Depot - Railroad Maintenance Facility	S-1

LIST OF FIGURES

	<u>Page</u>
Figure 1-1 General Vicinity Map of the Tooele Army Depot	1-5
Figure 1-2 Master Facility Map of the Tooele Army Depot, North Post, General Site Plan	1-6
Figure 1-3 Master Facility Map of the Tooele Army Depot, South Post, General Site Plan	1-7
Figure 1-4 Land Use Map for Tooele Army Depot, North Post	1-8
Figure 1-5 Land Use Map for Tooele Army Depot, South Post	1-11
Figure 2-1 Fremont Regional Variation	2-17
Figure 2-2 Boundary of Western Shoshoni and Gosiute Territory	2-20
Figure 2-3 Linguistic Boundaries	2-22
Figure 2-4 Present Boundaries of Deep Creek and Skull Valley Gosiute Reservations	2-30
Figure 2-5 Major Exploration of Utah	2-32
Figure 2-6 Typical Mormon Townsite - 1870	2-34
Figure 2-7 Location of Pony Express in Gosiute Territory	2-36
Figure 2-8 19th Century Utah Mineral Development	2-38
Figure 2-9 Major Utah Railroads	2-39
Figure 3-1 Historic and Present Ground Disturbance -- Tooele Army Depot - North Post	3-2
Figure 3-2 Historic and Present Ground Disturbance -- Tooele Army Depot - South Post	3-3
Figure 5-1 Known, Potential and Surveyed Archeological Sites -- Tooele Army Depot - North Post	5-6
Figure 5-2 Known, Potential and Surveyed Archeological Sites -- Tooele Army Depot - South Post	5-7

LIST OF FIGURES (Continued)

	<u>Page</u>
Figure 6-1 Location of On-Going and Planned Activities Tooele Army Depot - North Post	6-2
Figure 6-2 Location of On-Going and Planned Activities Tooele Army Depot - South Post	6-3
Figure 6-3 Picture Cave Petroglyph	6-16
Figure 6-4 Rocky Ridge Petroglyph	6-17
Figure 6-5 Compliance Procedure	6-18

LIST OF TABLES

<u>Page</u>		
Table 1-1	Land Use on Tooele Army Depot - North Post	1-9
Table 1-2	Land Use on Tooele Army Depot - South Post	1-12
Table 2-1	A Summary of the Environmental History of the Area of the Tooele Army Depot	2-9
Table 2-2	A Summary of the Cultural Chronology of the Area of the Tooele Army Depot	2-41
Table 2-3	Research Design: Problem Domains and Data Requirements for the Tooele Army Depot	2-47
Table 3-1	A Summary of Historic and Modern Ground Disturbance That Might Limit the Present Archeological Resource Base on the Tooele Army Depot, North Post	3-4
Table 3-2	A summary of Historic and Modern Ground Disturbance That Might Limit the Present Archeological Resource Base on the Tooele Army Dept, South Post	3-6
Table 3-3	Archeological Surveys Conducted on the Tooele Army Depot	3-9
Table 3-4	Archeologically Relevant Research Investigations, Exclusive of Archeological Surveys, Conducted on the Tooele Army Depot	3-10
Table 4-1	Presently Identified Archeological Resources on the Tooele Army Depot: Administrative Data	4-2
Table 4-2	Presently Identified Archeological Components on the Tooele Army Depot: Descriptions	4-3
Table 4-3	Presently Known Artifact, Ecofact, or Documentary Collections from Archeological Resources on the Tooele Army Depot	4-4
Table 4-4	Potentially Identifiable But Not Presently Recorded Archeological Resources on the Tooele Army Depot	4 5
Table 5-1	Summary of Significant Archeological Resources on the Tooele Army Depot	5-3
Table 6-1	A Summary of On-Going and Planned Activities on the Tooele Army Depot That Could Affect Archeological Resources	6-4
Table 6-2	Costs of Optional Management Recommendation	6-20

LIST OF ACRONYMS

Advisory Council on Historic Preservation	ACHP
Before Present	BP
Bureau of Indian Affairs	BIA
Bureau of Land Management	BLM
Chemical Agent Munitions Disposal System	CAMDS
Council on Environmental Quality	CEQ
Defense Property Disposal Office	DPDO
Federal Land Policy and Management Act	FLPMA
High Explosives	HE
Historic Preservation Plan	HPP
Indian Reorganization Act	IRA
Memorandum of Agreement	MOA
National Environmental Policy Act	NEPA
National Historic Preservation Act	NHPA
National Park Service	NPS
National Register of Historic Places	NRHP
Society of Professional Archeologists	SOPA
State Historic Preservation Officer	SHPO
Tooele Army Depot Railroad	AD-RR
U.S. Army Materiel Development and Readiness Command	DARCOM

FOREWARD

Stearns-Roger has developed a regionally based prehistoric, ethnographic, historic overview and management plan for the Tooele Army Depot (North and South). Included are a realistic research design and management recommendations for the cultural resources known to exist within the study area. In addition, a hierarchical model is also provided which identifies basic problem domains, research topics, and specific research questions, as well as the data base needed to resolve these questions.

The synthetic overview and research design presented here, while specifically applicable to the Army Depot, are flexible enough to accommodate any new information as it becomes available.

Stearns-Roger Services, Inc.

James Grady
Principal Investigator

SECTION 1

CHAPTER 1.0 INTRODUCTION

1.1 PURPOSE AND NEED

This archeological study was conducted for the Tooele Army Depot to develop a comprehensive cultural resource management plan. This plan should be addressed in the installation Master Plan for compliance with the following federal statutes and orders regarding cultural resources:

- Antiquities Act of 1906
- Historic Sites Act of 1935
- Reservoir Salvage Act of 1960
- National Historic Preservation Act (NHPA) of 1966
- National Environmental Policy Act of 1969
- Executive Order 11593 of 1971
- Archeological and Historic Preservation Act of 1974
- Archaeological Resources Protection Act of 1979

1.1.1 Federal Mandates

The federal government recognized that important archeological resources are valuable, non-renewable aspects of our cultural heritage. A myriad of federal laws, regulations, executive orders, and guidelines have been enacted to consider our cultural heritage in the federal planning process.

Federal agency archeological responsibilities began with passage of the Antiquities Act of 1906 (PL 59-209; 16 USC 431-433), which enabled the federal government to set aside and protect "historic landmarks, historic, and prehistoric structures and other objects of historic or scientific interest."

The Historic Sites Act of 1935 (PL 74-292; 16 USC 461-471) established a policy to protect nationally significant properties and expanded the role of the Department of the Interior in identifying and protecting "historic and archeological sites, buildings, and objects."

The Reservoir Salvage Act of 1960 (PL 86-523; 74 Stat. 220; 16 USC 469-469c) provided for the protection of data of "exceptional historical or archeological significance" which would be impacted by reservoir construction.

It was not until 1966, with passage of the National Historic Preservation Act (NHPA), (16 USC Sec. 470f as amended, 90 Stat. 1320), that all federal agencies were mandated to consider the effects of their projects and programs on cultural properties listed on the National Register of Historic Places (NRHP). Further amendments (PL 91-243, 93-54, 94-422, 94-458, 96-199, 76-244, 96-515) require the following of all federal agencies:

1. Inventory, evaluate, and (where appropriate) nominate to the NRHP all archeological properties under agency ownership or control (Sec. 110(a)(2)).

2. Prior to the approval of any ground-disturbing activity, consider the project's effect on any property listed on the NRHP or any eligible property, and afford the Advisory Council of Historic Preservation (ACHP) a reasonable opportunity to comment on the proposed project (Sec. 106).
3. Complete an appropriate data recovery program on an eligible or listed archeological property before it is damaged or destroyed (Sec. 110(b)), as reported by the House Committee on Interior and Insular Affairs (96th Congress, 2nd Session, House Report No. 96-1457, p. 36-37).

In January 1967, to obtain the mandatory participation of the states in the NRHP program, the Secretary of the Interior sent letters to the governors requesting each to designate a representative responsible for preparing surveys, receiving grants, and working with the Department of the Interior in developing the program. The role of the states and the duties of the State Historic Preservation Officer (SHPO) were first published in the Federal Register (FR), February 1969.

The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190; 83 Stat. 852; 42 USC 4321) requires that all aspects of the environment, including important historic properties, be considered during planning of any major federal action, through the preparation and review of environmental impact statements. Also, the Federal Land Policy and Management Act of 1976 (FLPMA) (P.L. 94-579; 90 Stat. 2743) declares that it is public policy to manage public lands in a manner that will protect historic resources (Section 102(a)(8)).

Executive Order 11593, "Protection and Enhancement of the Cultural Environment," was signed by President Nixon in 1971. The Order authorized federal agencies, with the advice of the Secretary of the Interior and in cooperation with the SHPO, to locate, inventory, and nominate to the Secretary of the Interior all sites, buildings, districts, and objects under their jurisdiction or control that appear to qualify for listing on the NRHP. The Order afforded protection to those properties eligible for and listed on the NRHP.

The Archeological and Historic Preservation Act of 1974 (PL 93-291; 88 Stat. 174; 16 USC 469) requires that notice of any federal project adversely affecting a significant archeological property be provided to the Secretary of the Interior; either the Secretary or the notifying agency may require a cultural resource data recovery program, if appropriate, to preserve valuable information.

The Archaeological Resources Protection Act of 1979 (PL 96-95; 93 Stat. 721; 16 USC 470aa) supersedes the Antiquities Act of 1906 (93 Stat. 225; 16 USC 431-32) and establishes provisions that allow the Secretary of the Army to issue excavation permits for archeological resources on U.S. Army Materiel Development and Readiness Command (DARCOM) lands (Sec. 4). The Act also establishes stringent fines and extended prison sentences for anyone removing artifacts from public lands without a permit.

The Council regulations, "Protection of Historic and Cultural Properties" 36 CFR 800, set forth procedures for compliance with Section 106 of the NHPA.

Regulations from the Department of the Interior establish procedures for determining site eligibility for the National Register of Historic Places (36 CFR 60, 36 CFR 63), standards for data recovery (Department of Interior, 43 CFR Part 7, Department of Defense, 32 CFR Part 229), and procedures implementing the Archaeological Resources Protection Act (proposed 36 CFR 69).

Guidance from the U.S. Department of the Army establish procedures and standards for the preservation of historic properties (32 CFR 650.181-650.193; Technical Manual 5-801-1; Technical Note 78-17; Army Regulation 420.XX), (Knudsen et al. 1983:2-14).

It is the intent of DARCOM to comply with these policies and integrate into their Master Plan procedures regarding preservation of archeological and historical properties. Data have been collected and synthesized for integration into the Master Plan. Recommendations in this report for identification and preservation of those properties eligible to the NRHP will assist the DARCOM installation in their compliance responsibilities.

1.1.2 Native American Indian Legislation

In addition to federal legislation requiring agencies to consider cultural properties in their planning process, legislation also requires consideration of Native American Indian sacred and cultural values. NEPA requires that sacred areas of Native Americans be identified for potential impact; NHPA also addresses the need to identify Native American cultural resources. The American Indian Religious Freedom Act of 1978 (PL 95-341; 92 Stat. 469) legalizes a special status for sacred places, artifacts, animals, and plants of Native American peoples. This act guarantees American Indian access to sacred sites required in their religion, including cemeteries. This Act also guarantees Native Americans the freedom to use sacred resources and natural species in practicing their religion.

Council on Environmental Quality (CEQ) guidelines clarify the role of Native Americans in the NEPA process. Section 40 CFR 1501.7 allows affected Indian tribes' participation in the early planning process to formulate issues and participate in research. The lead agency shall request the comments of affected Indian Tribes to review and comment on draft Environmental Impact Statements (40 CFR 1503.1).

Because Utah Army installations are adjacent to present Indian reservations and research has identified early tribal territories to be within the boundaries of the installation, Native American values have been addressed extensively in Section 2.2.2.

1.2 THE TOOELE ARMY DEPOT

The following description of the installation has been condensed from the Installation Environmental Assessment (Inland Pacific Engineering Company 1982).

The Tooele Army Depot, located in north central Utah, is under one command but consists of two separate areas, the North and South Posts. The North Post is located in Tooele Valley approximately 2 miles (3.2 kilometers)

south of the City of Tooele and 35 miles (56.3 kilometers) southwest of Salt Lake City. The South Post is located in Rush Valley approximately 15 miles (24.1 kilometers) south of the North Post (Figure 1-1).

The North Post comprises 24,732 acres (10,009 hectares) and contains facilities for the overall administration of both the North and South Posts (Figure 1-2). The South Post comprises 19,364 acres (7837 hectares) and is responsible primarily for the storage and disposal of chemical munitions (Figure 1-3).

1.2.1 North Post Land Use

Land use and activity areas on the North Post are illustrated in Figure 1-4. Table 1-1 lists the major land uses and the approximate acreage devoted to each.

The igloo storage area, located within the central portion of the Depot, constitutes the predominant land uses at the North Post. Various munitions are transported by truck or rail and stored in this area. The rail system serves various loading areas, which are linked to the 960 storage igloos (over 1.8 million sq. ft. of storage) by an internal road system.

The open revetment storage area consists of open earth revetments, used in the past as a munitions storage area, with the exception of sporadic inert materials storage (packing cases, empty canisters). No use is planned for this area. The area is served by an internal road system.

The open storage areas located around the warehouse and supply area, maintenance area, and Defense Property Disposal Office (DPDO) yard are used for temporary storage of material and military equipment for rehabilitation or future permanent storage. A grid road network serves these areas; the roads are prepared earth surfaces.

The buffer areas, non-use areas which extend along the periphery of the Depot, provide open buffers from the munitions storage areas. The reserve training maneuver areas are located within the southern buffer area.

The ammunition demolition area, located in the southwestern corner of the Depot, consists of control facilities and open areas where obsolete munitions are buried for demolition. A burning area for dunnage and other contaminated material also is located in the demolition area.

Ammunition maintenance areas include three areas located on the southwestern periphery of the igloo storage area. The maintenance buildings and loading areas, served by rail and truck, are used to maintain various munitions ranging from small arms to guided missiles.

Above-ground magazines also are located along the southwestern periphery of the igloo storage areas. This area consists of concrete block and reinforced block buildings used for munitions storage. Rail and truck access is provided to the magazines.

The chemical range is located along the western portion of the southern boundary of the North Post. This area is no longer in active use (except for flare usage) because the safety cone extends beyond the Depot boundaries.

The rifle range is located near the western periphery of the Depot and is used infrequently for small weapons target practice.

The rifle range is located near the western periphery of the Depot and is used infrequently for small weapons target practice.

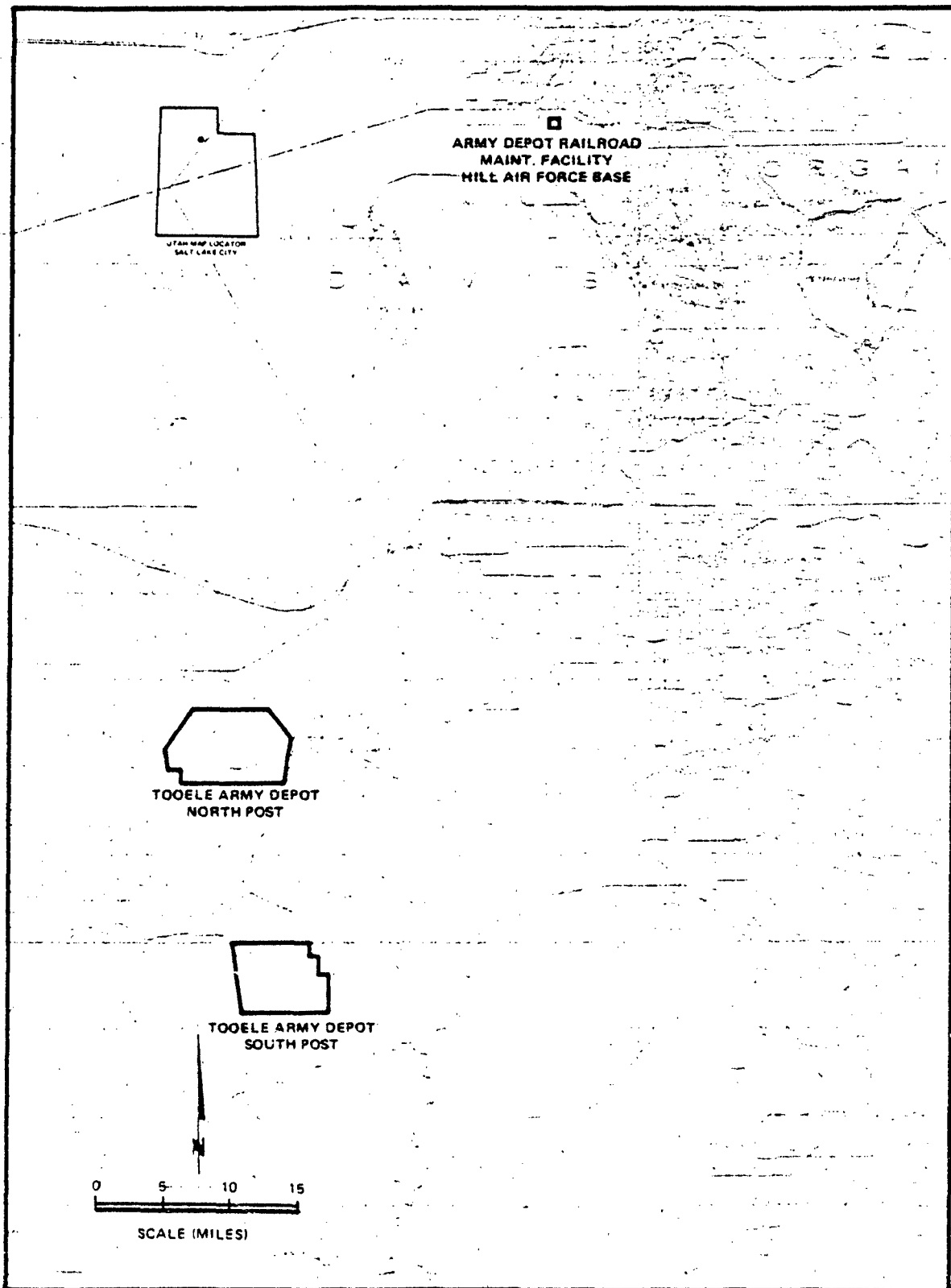


Figure 1-1. GENERAL VICINITY MAP
OF TOOELE ARMY DEPOT

**MASTER FACILITY MAP OF THE
TOOELE ARMY DEPOT
NORTH POST**

Figure 1-2 GENERAL SITE PLAN

①

43000 W
43500 W
44000 W
44500 W
45000 W
45500 W
46000 W

43000 W

43500 W

44000 W

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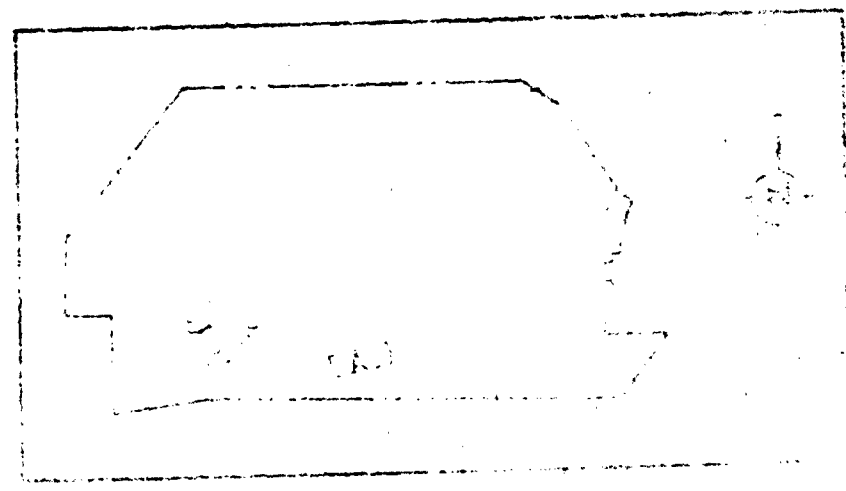
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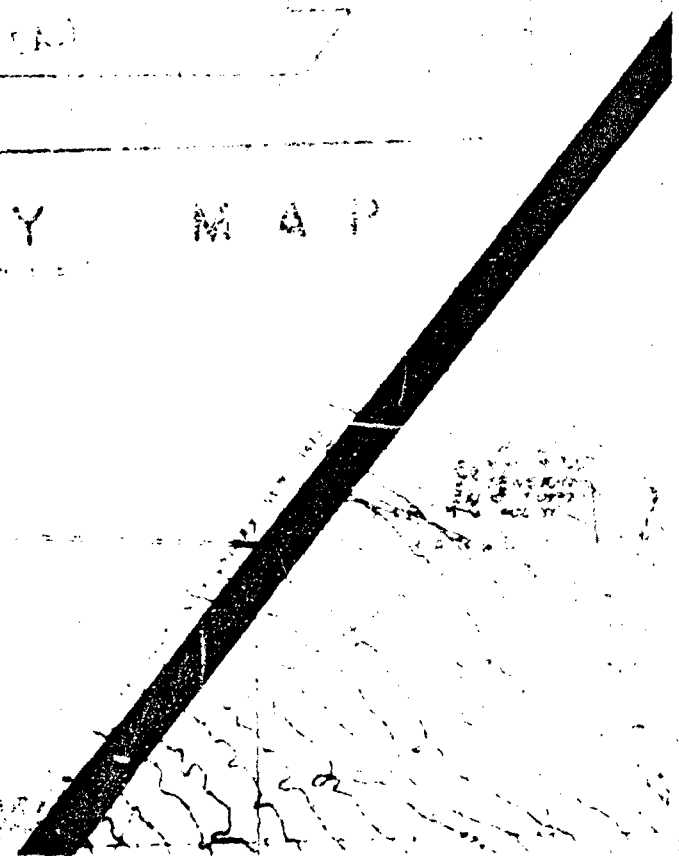
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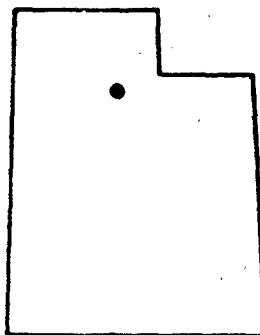
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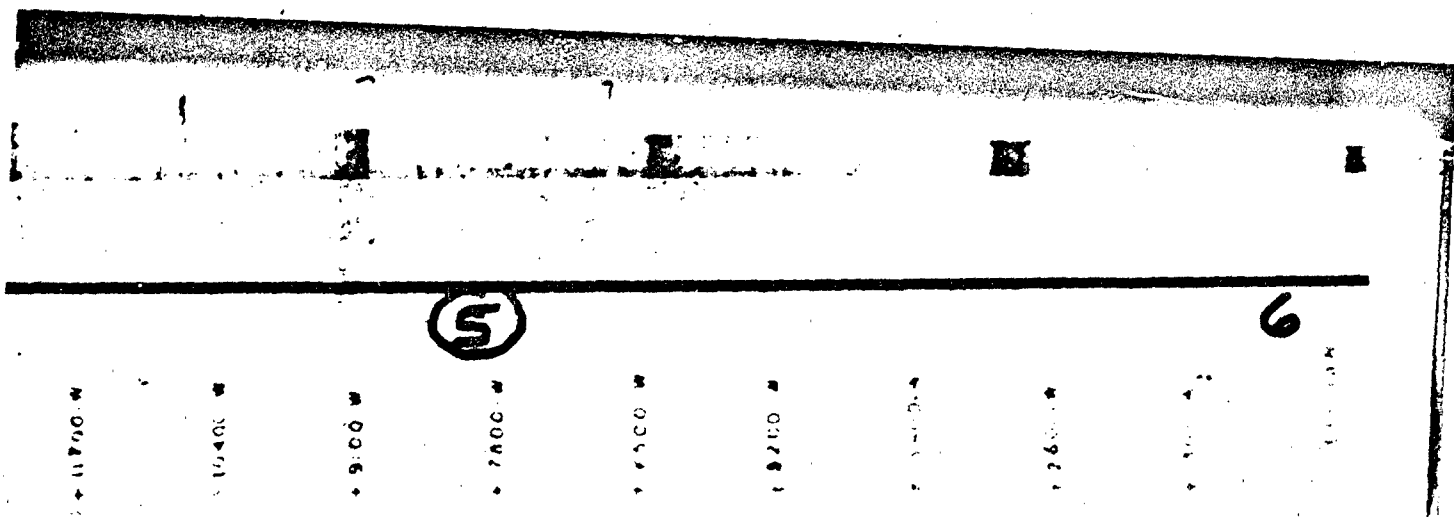
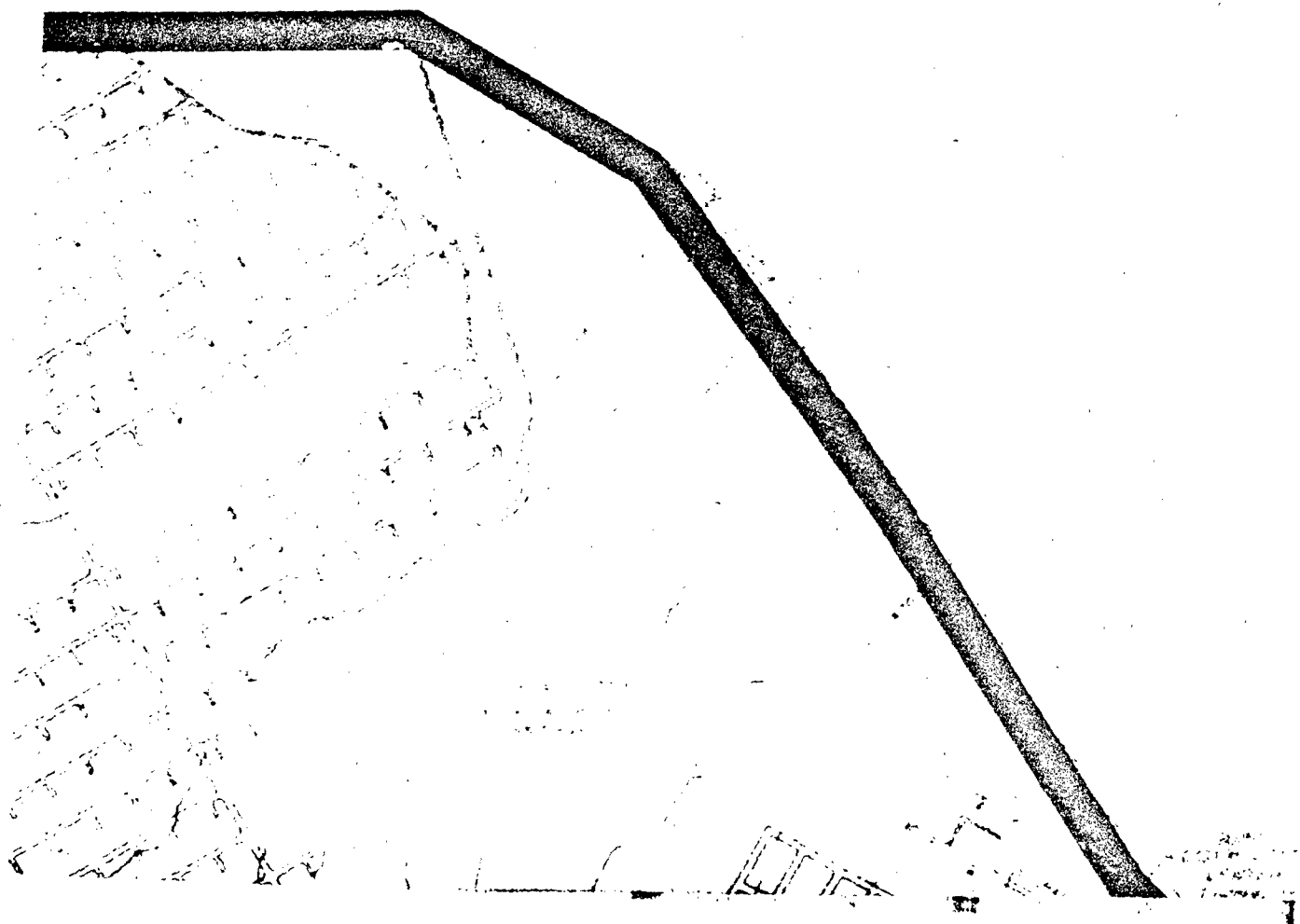


Figure 1-2. MASTER FACILITY MAP OF



6

LEWISIAN

AP OF TOOEELE ARMY DEPOT - NORTH POST



BORDER OF STUDY AREA

SUPPLY
DISTRIBUTION
CENTERS

U.S. ARMY, 1911-22

⑦

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1000

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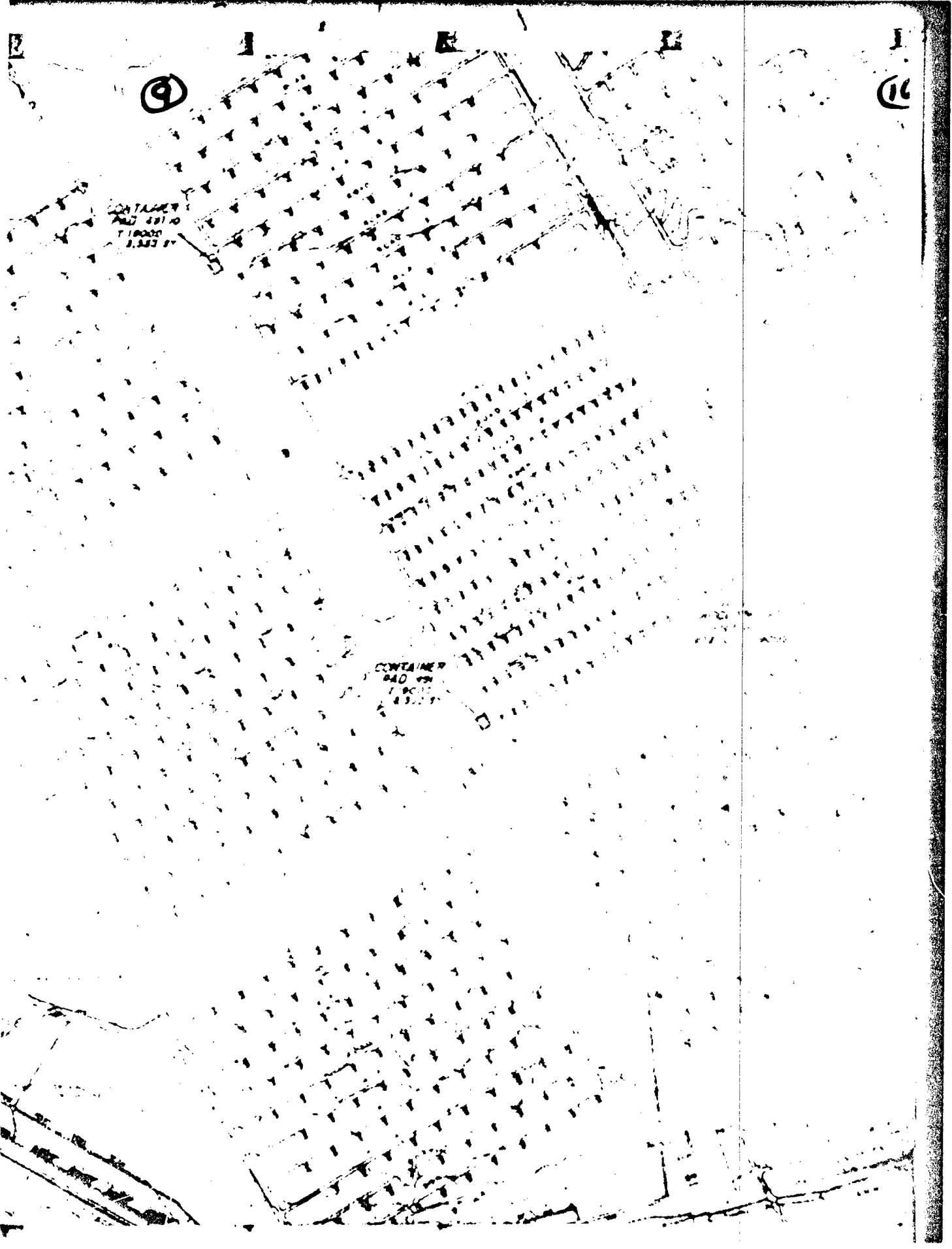
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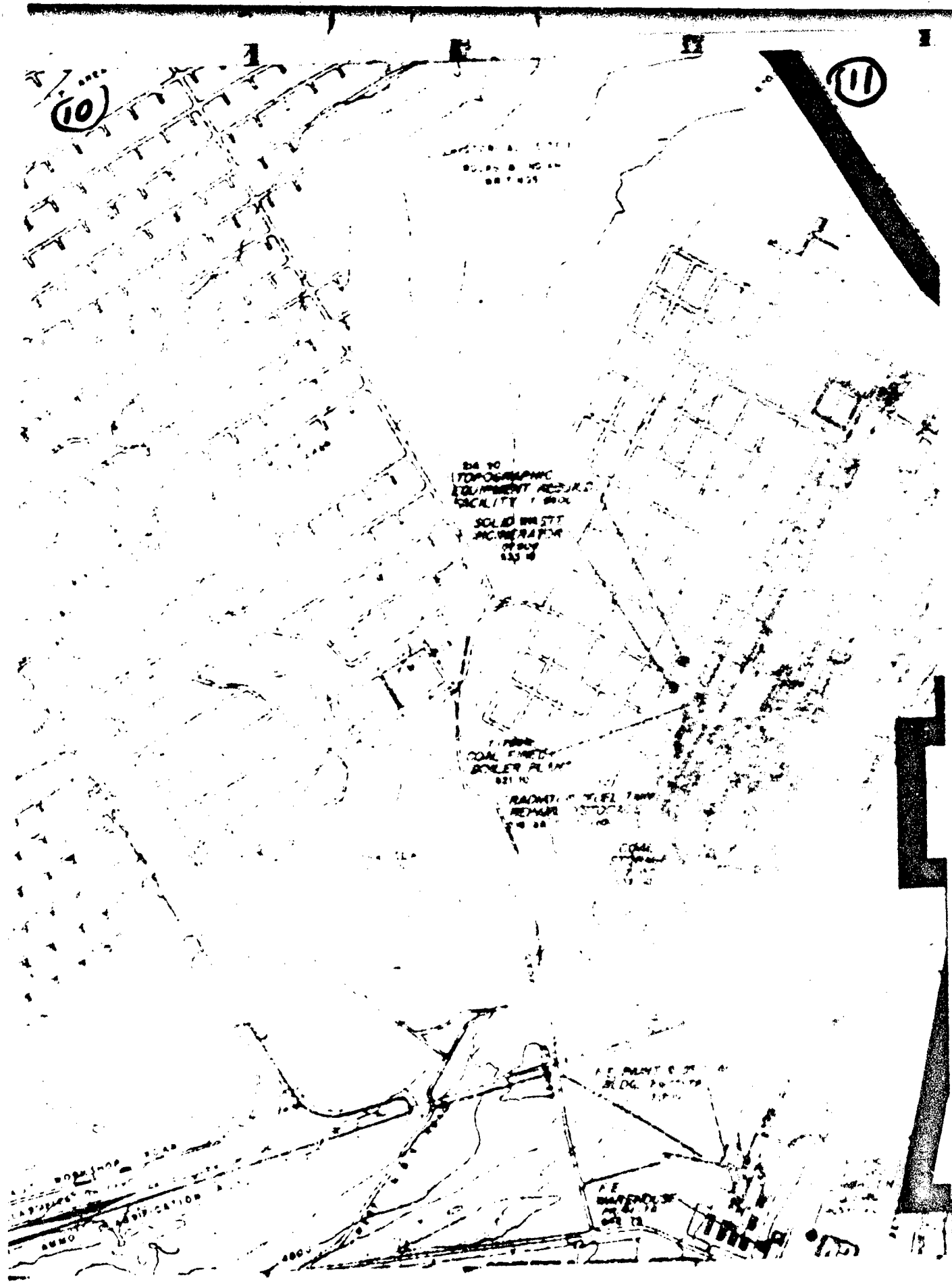
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1000







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11

24 TO
TOPOGRAPHIC
EQUIPMENT RECORD
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SOLID BRIST
EQUIPMENT
1 000
1 000

1 000
COAL
BOILER
PLANT
1 000

RAILROAD
STATION
1 000

1 000
BRIDGE
CROSSING
1 000

1 000
DRAINAGE
1 000

ROAD
BRIDGE
CROSSING
1 000

**SUPPLY
DISTRIBUTION
CENTER**
7 AMPS 101 33

1000
1000
1000
1000

1. DATE 10/10/70
 2. TIME 10:10
 3. LOCATION 10:10
 4. REMARKS 10:10
 5. INITIALS 10:10
 6. SIGNATURE 10:10
 7. DATE 10/10/70
 8. TIME 10:10
 9. LOCATION 10:10
 10. REMARKS 10:10
 11. INITIALS 10:10
 12. SIGNATURE 10:10
 13. DATE 10/10/70
 14. TIME 10:10
 15. LOCATION 10:10
 16. REMARKS 10:10
 17. INITIALS 10:10
 18. SIGNATURE 10:10
 19. DATE 10/10/70
 20. TIME 10:10
 21. LOCATION 10:10
 22. REMARKS 10:10
 23. INITIALS 10:10
 24. SIGNATURE 10:10
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 26. TIME 10:10
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 32. TIME 10:10
 33. LOCATION 10:10
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 36. SIGNATURE 10:10
 37. DATE 10/10/70
 38. TIME 10:10
 39. LOCATION 10:10
 40. REMARKS 10:10
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 42. SIGNATURE 10:10
 43. DATE 10/10/70
 44. TIME 10:10
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 46. REMARKS 10:10
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 48. SIGNATURE 10:10
 49. DATE 10/10/70
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 52. REMARKS 10:10
 53. INITIALS 10:10
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 55. DATE 10/10/70
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 86. TIME 10:10
 87. LOCATION 10:10
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 91. DATE 10/10/70
 92. TIME 10:10
 93. LOCATION 10:10
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 163. DATE 10/10/70
 164. TIME 10:10
 165. LOCATION 10:10
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 167. INITIALS 10:10
 168. SIGNATURE 10:10
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 170. TIME 10:10
 171. LOCATION 10:10
 172. REMARKS 10:10
 173. INITIALS 10:10
 174. SIGNATURE 10:10
 175. DATE 10/10/70
 176. TIME 10:10
 177. LOCATION 10:10
 178. REMARKS 10:10
 179. INITIALS 10:10
 180. SIGNATURE 10:10

12 Aug 1982
DATE

Dennis E. Bingham
DENNIS E. BINGHAM
CHIEF, FACILITIES ENGINEERING DIVISION

US AIR TRAINING
CENTRE
14105, 14106, 14107, 14108, 14109, 14110

NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN

12

BORDER OF STUDY AREA

DATED
2/12/82
ACTION
BY 214 90, 2 12 82
TO
FROM
SUBJECT

"ON-SITE INSPECTION HAS BEEN COMPLETED FOR ENVIRONMENTAL, HISTORICAL, ECONOMIC, AND OPERATIONAL CONSIDERATIONS FOR EACH PROPOSED ITEM.

12 Aug 1982
DATE

Dennis E. Bingham
DENNIS E. BINGHAM
CHIEF, FACILITIES ENGINEERING DIVISION

NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN.

9100 2-

11400-5

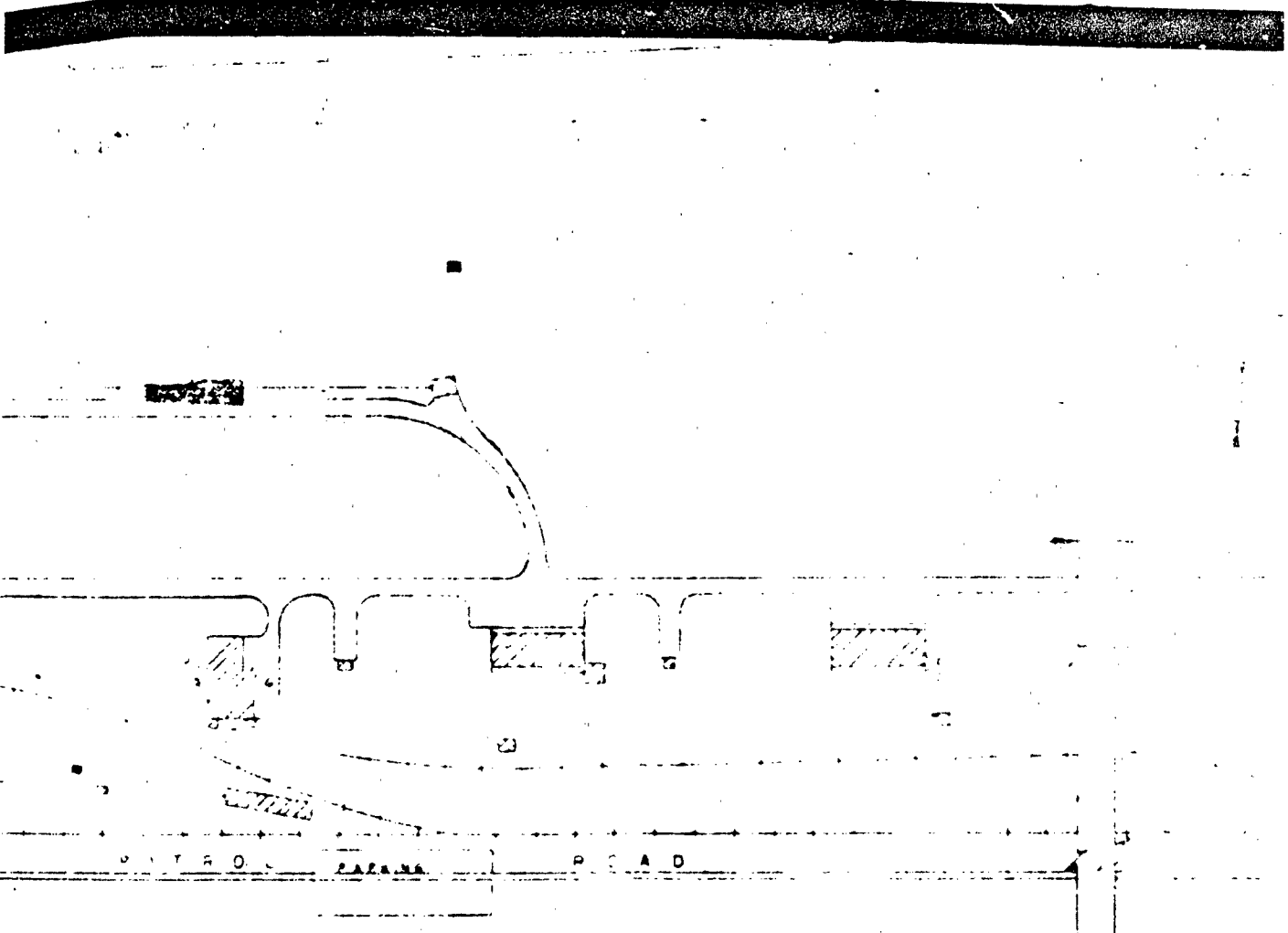
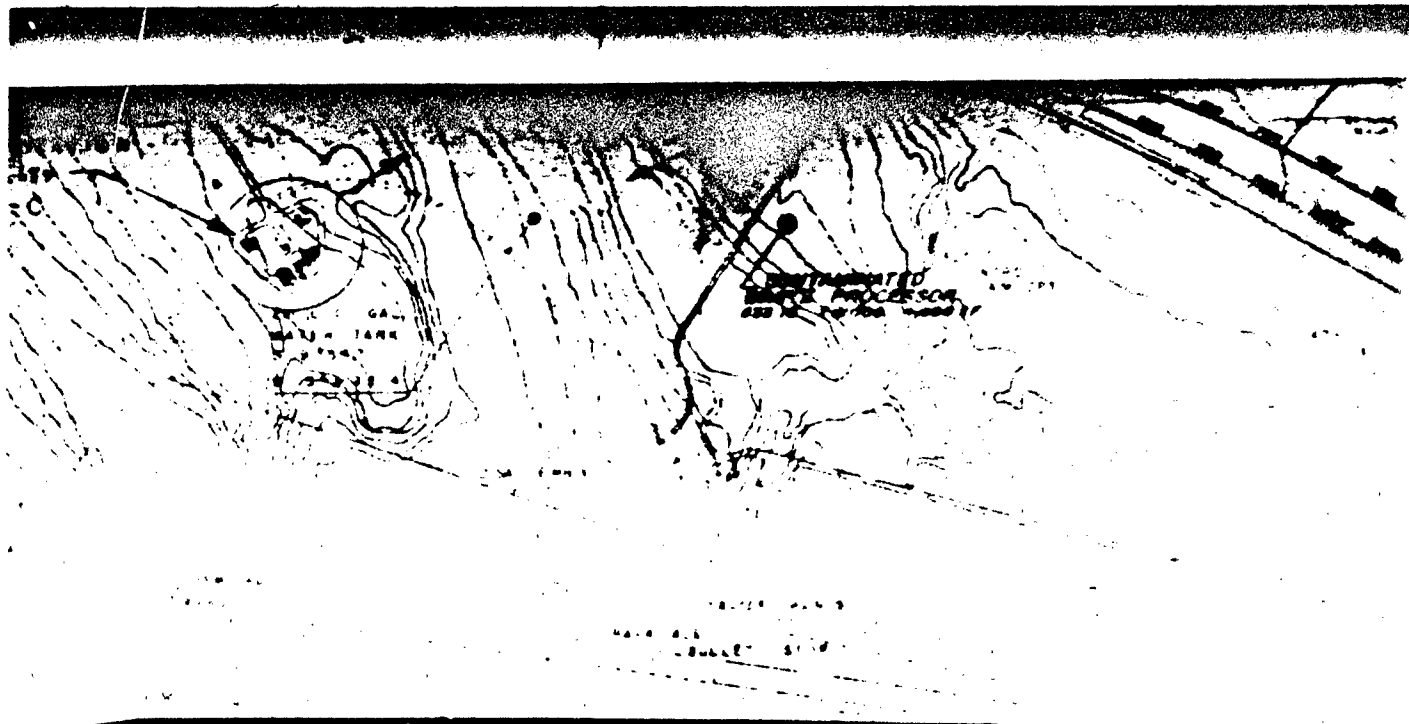
11700-5

AMMUNITION
DEPARTMENT
SECURITY

5'
SCALE

ENLARGED AMMUNITION

13

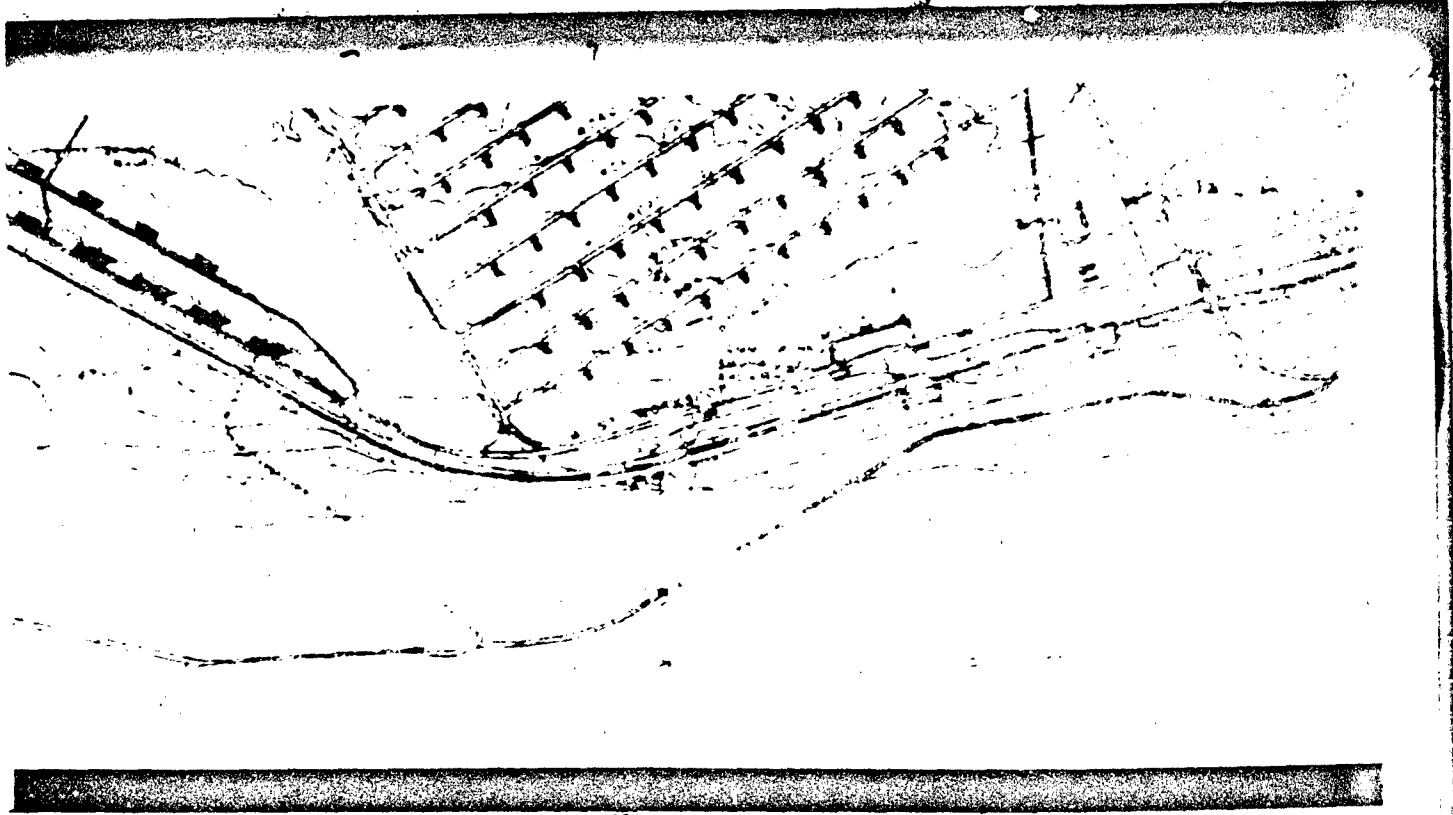


TION WORKSHOPS AREA "A"

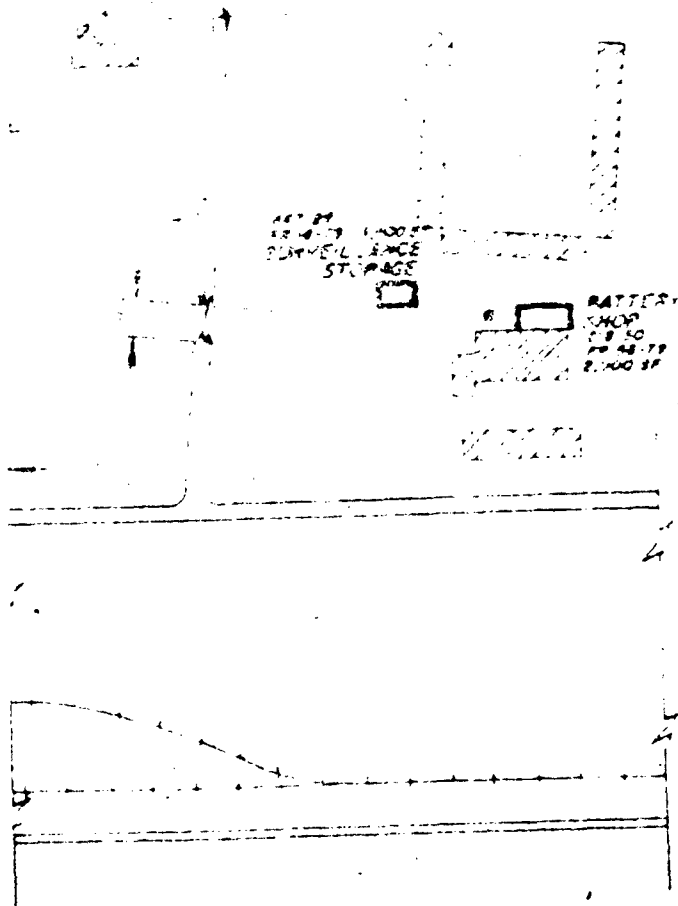


1" = 200'

14

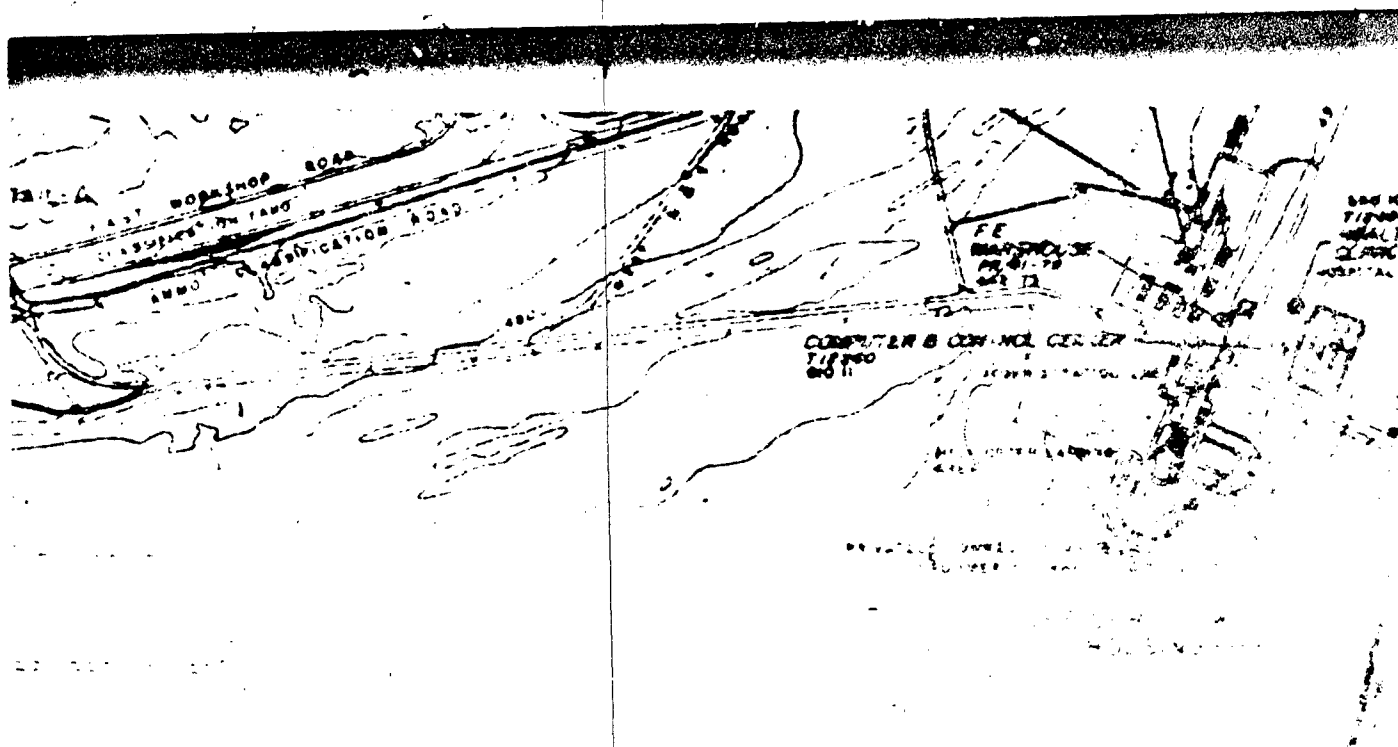


RESERVATION BOUNDARY



(14)

(15)



LEGEND

EXISTING FOR
12. 21. 1978

PROPOSED

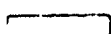
EXISTING



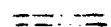
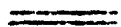
BUILDING, PERMANENT



BUILDING, SEMI-PERMANENT



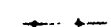
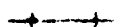
BUILDING, TEMPORARY



ROADS & PARKING



TRAIL OR FORTH ROAD



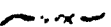
RAILROAD



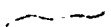
FENCE



RESERVATION BOUNDARY

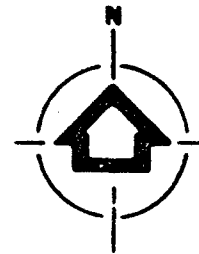
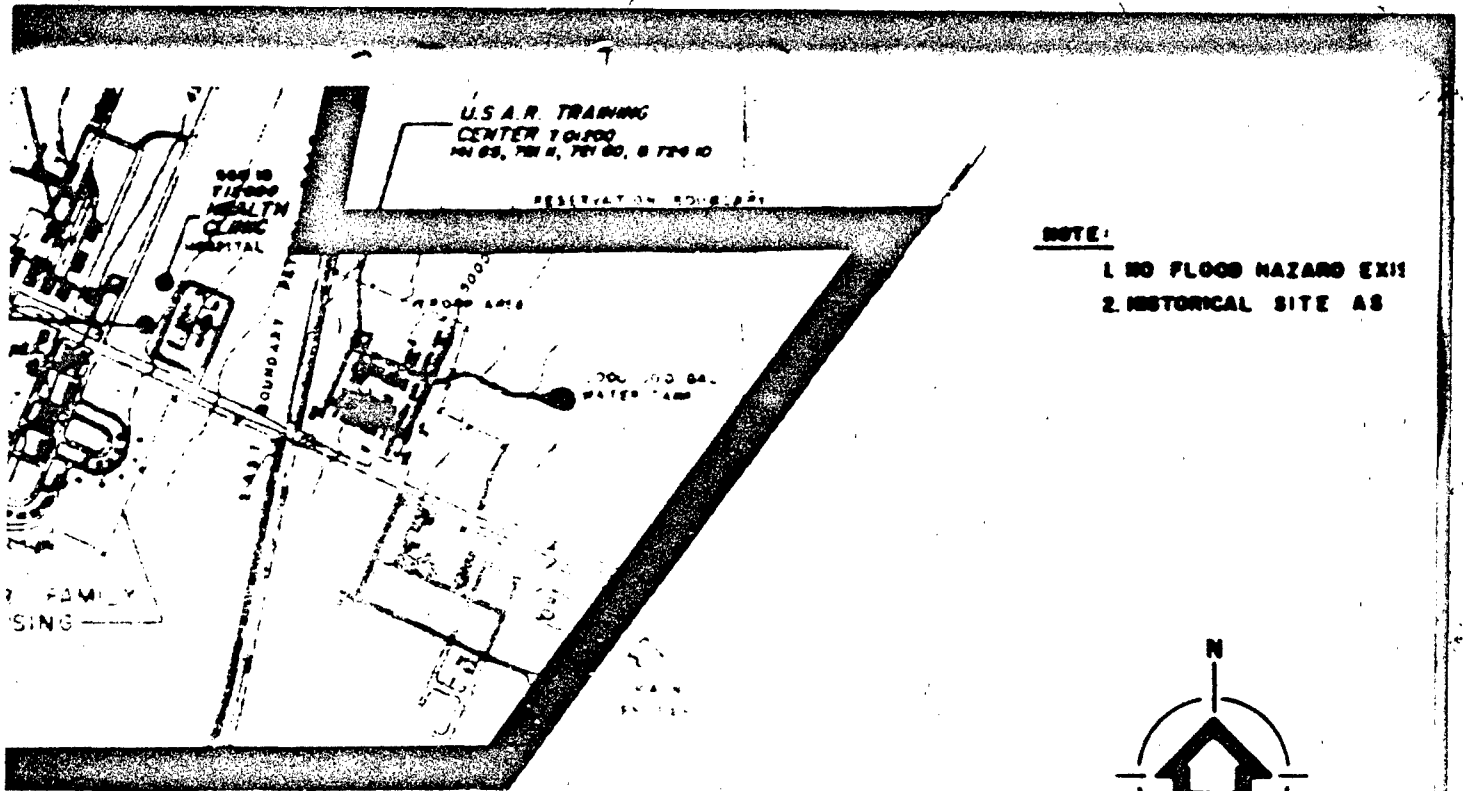


INDEX CONTOUR



INTERMEDIATE CONTOUR

6



CONTOUR INTERVAL 20 FEET

TOOELE ARMY DEPOT

TOOELE, UTAH

ROBERT G. MURR & ASSOCIATES
ARCHITECTS & PLANNERS
COLORADO SPRINGS, COLORADO 80903

U.S. ARMY
SACB

MASTER PLAN
PLANS FOR FUTURE DEVELOPMENT
GENERAL SITE PLAN

<p>APPROVED BY: <i>[Signature]</i> DATE: <i>[Date]</i> BY: <i>[Signature]</i> DATE: <i>[Date]</i></p>	
<p>17</p>	<p>_____</p> <p>_____</p> <p>_____</p>

CHIEF, FACILITIES ENGINEERING DIVISION

NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN.



SCALE IN FEET

CONTOUR INTERVAL 20 FEET

TOOELE ARMY DEPOT

TOOELE, UTAH

ROBERT G. MURR & ASSOCIATES
ARCHITECTS & PLANNERS
COLORADO SPRINGS, COLORADO 80903

U.S. ARMY ENGINEER DISTRICT SACRAMENTO
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA 95814

MASTER PLAN
PLANS FOR FUTURE DEVELOPMENT

GENERAL SITE PLAN

gen site plan

W. G. K. [Signature]

DATE: 10/1/81

BY: [Signature]

FOR: [Signature]

NOV 1982

TOOELE ARMY DEPOT

DATE
SEPT 1982

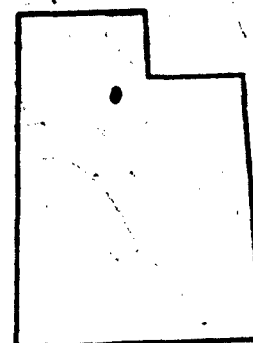
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18-04-01

DATE

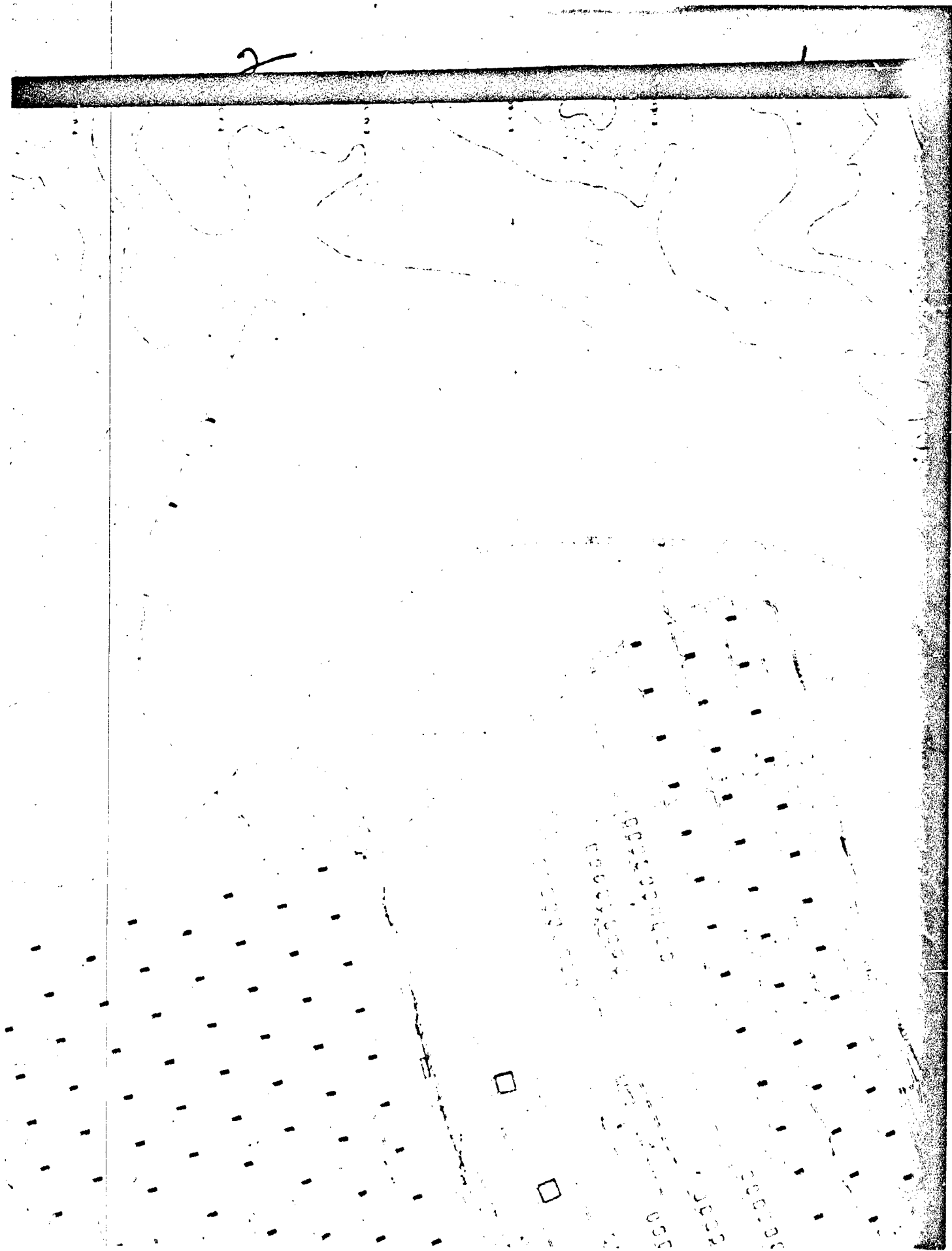
FILE

**MASTER FACILITY MAP OF THE
TOOELE ARMY DEPOT
SOUTH POST**

Figure 1-3 GENERAL SITE PLAN



UTAH MAP LOCATOR
SALT LAKE CITY



3

1

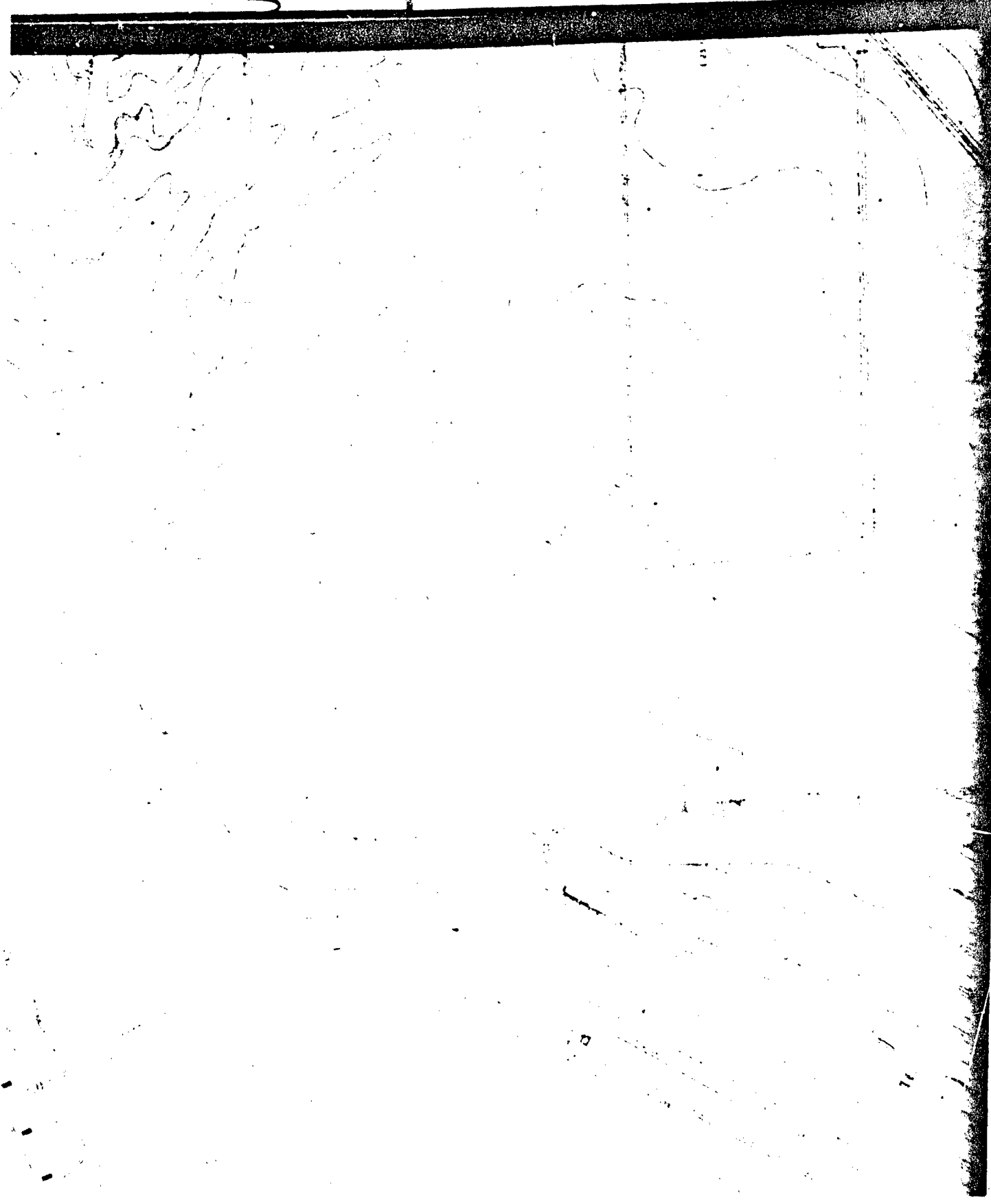
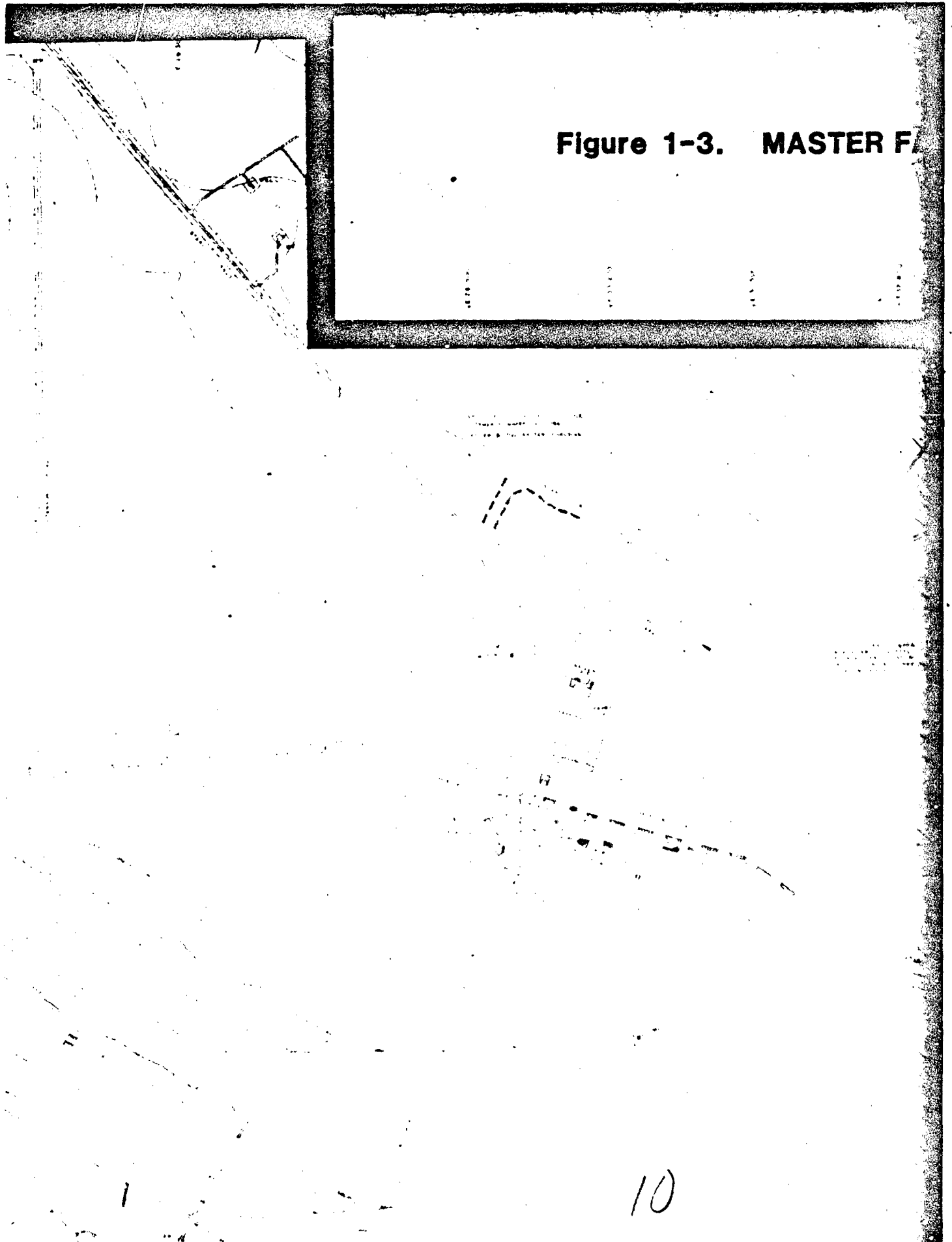
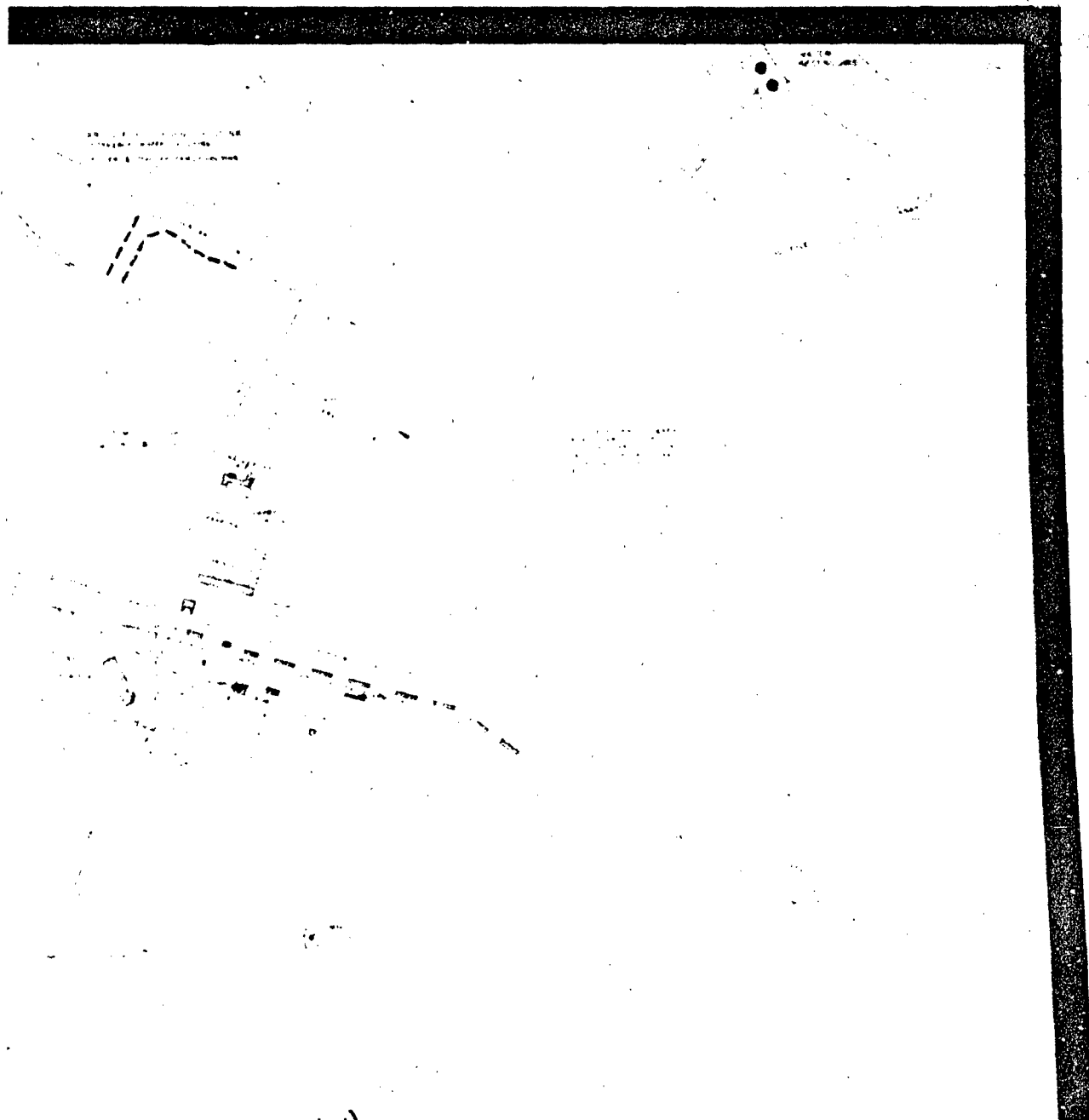


Figure 1-3. MASTER F



5

Figure 1-3. MASTER FACILITY MAP OF TOOELE

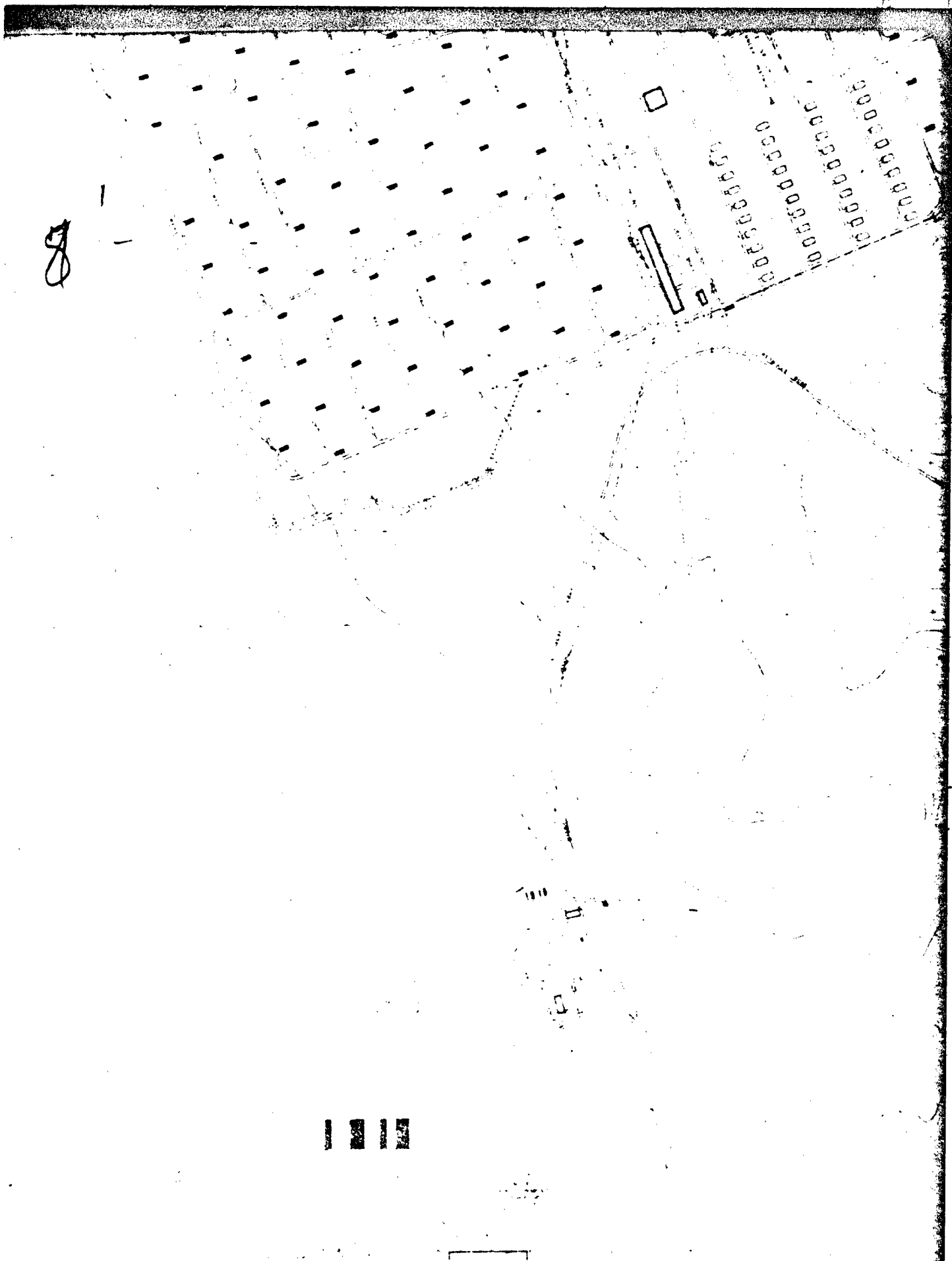


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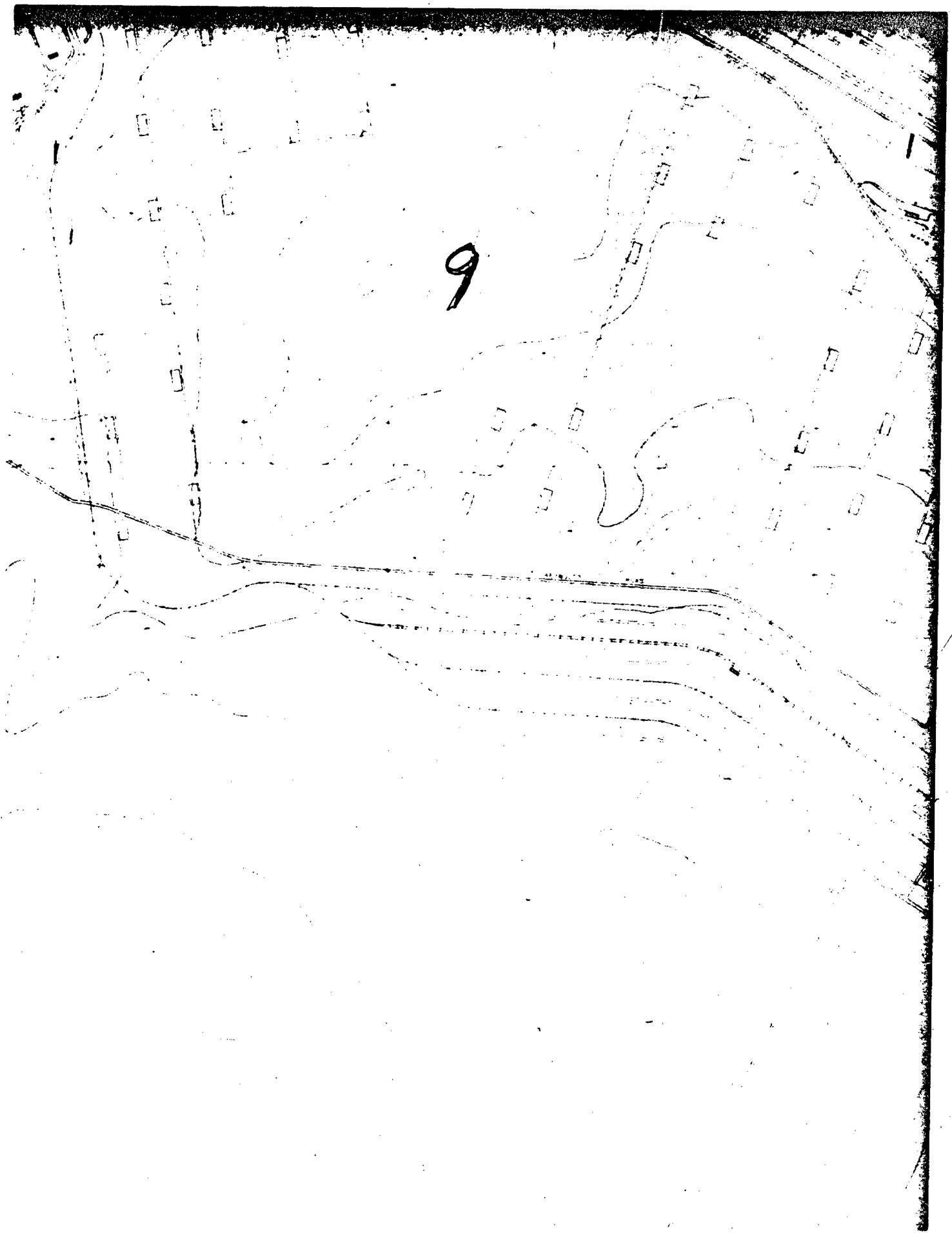


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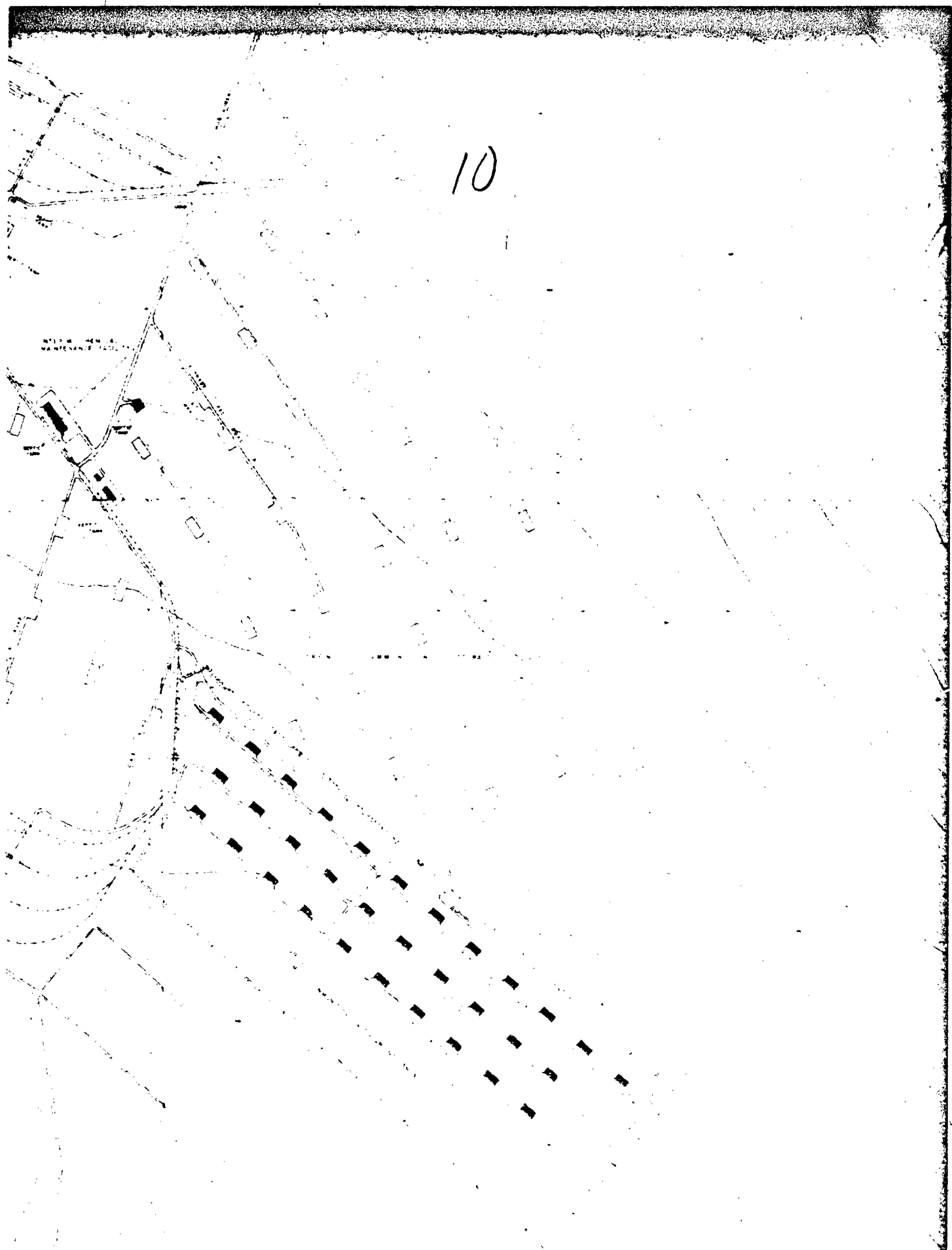
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9



10



11

W 14, 1961

W 14, 1961

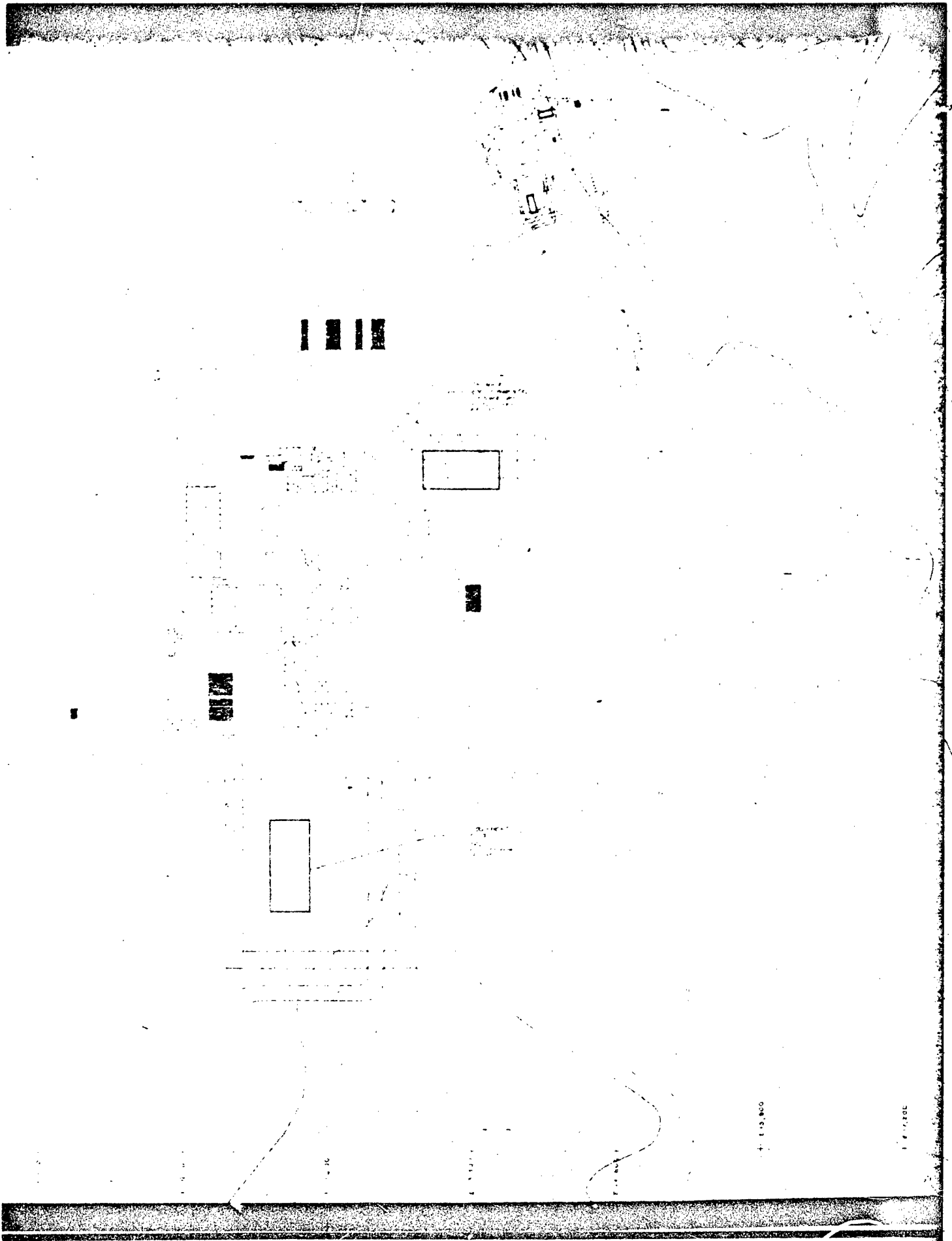
W 14, 1961

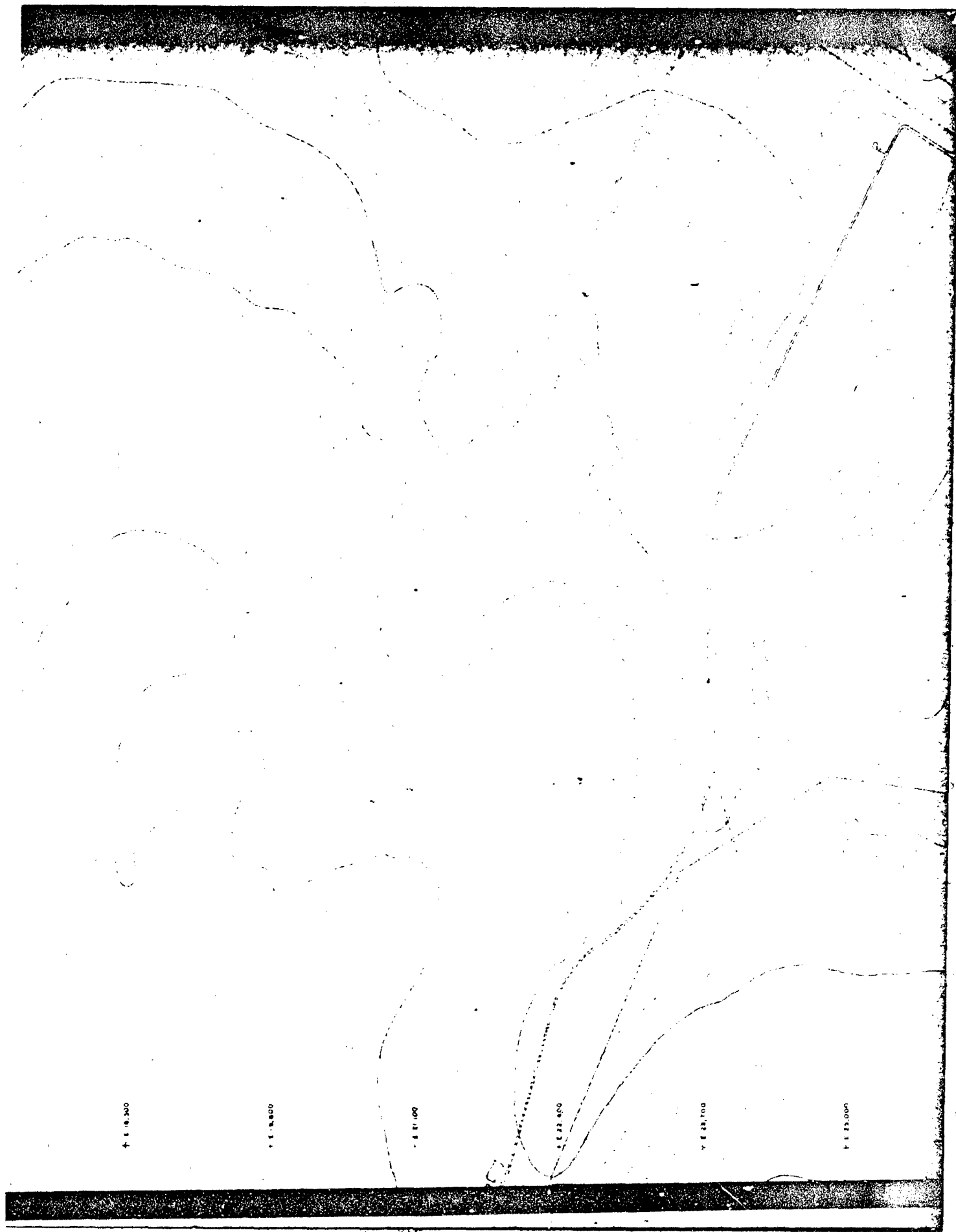
W 14, 1961

END

W 14, 1961	W 14, 1961	W 14, 1961
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93	93	93
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99	99	99
100	100	100

13





+ 18,300

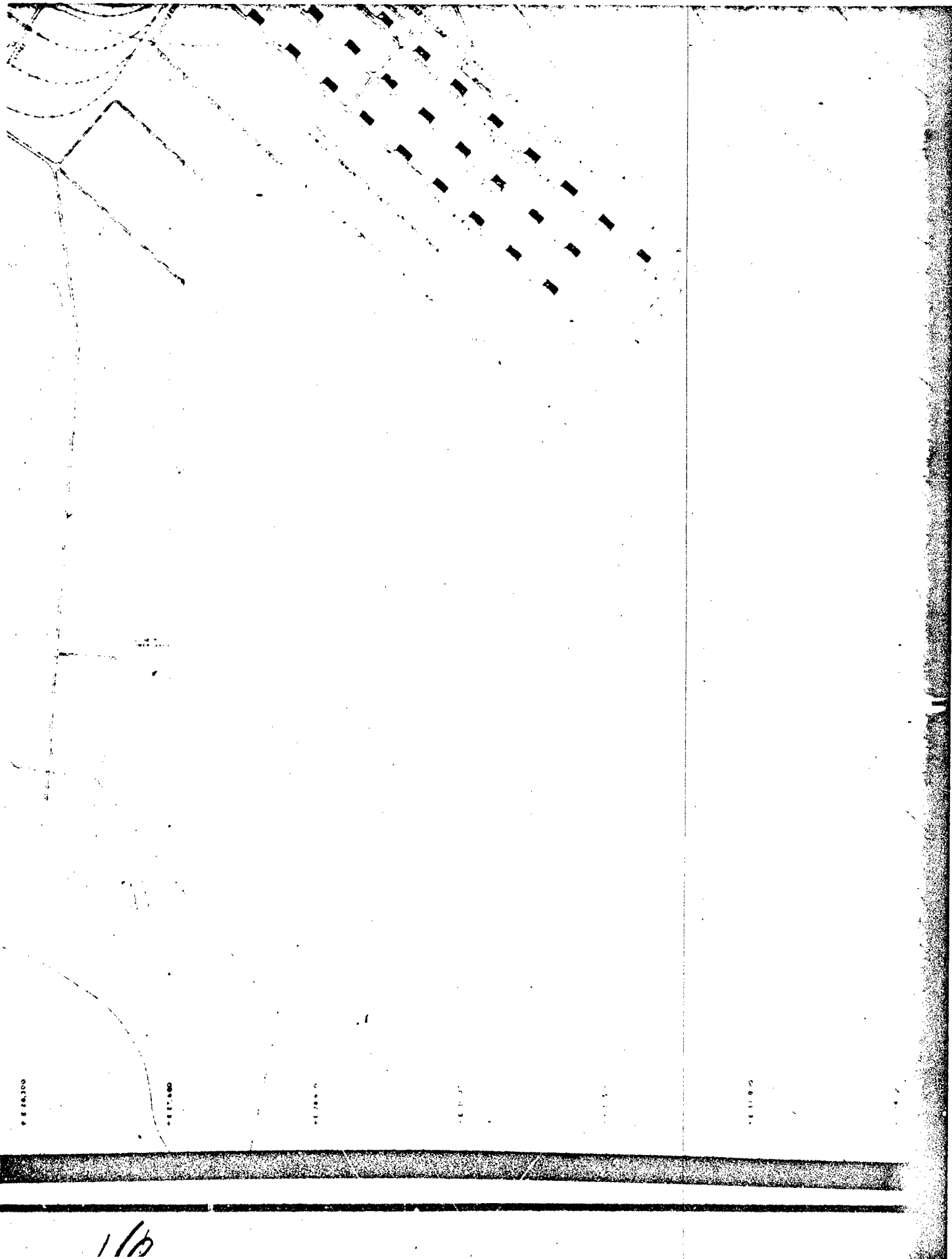
+ 18,500

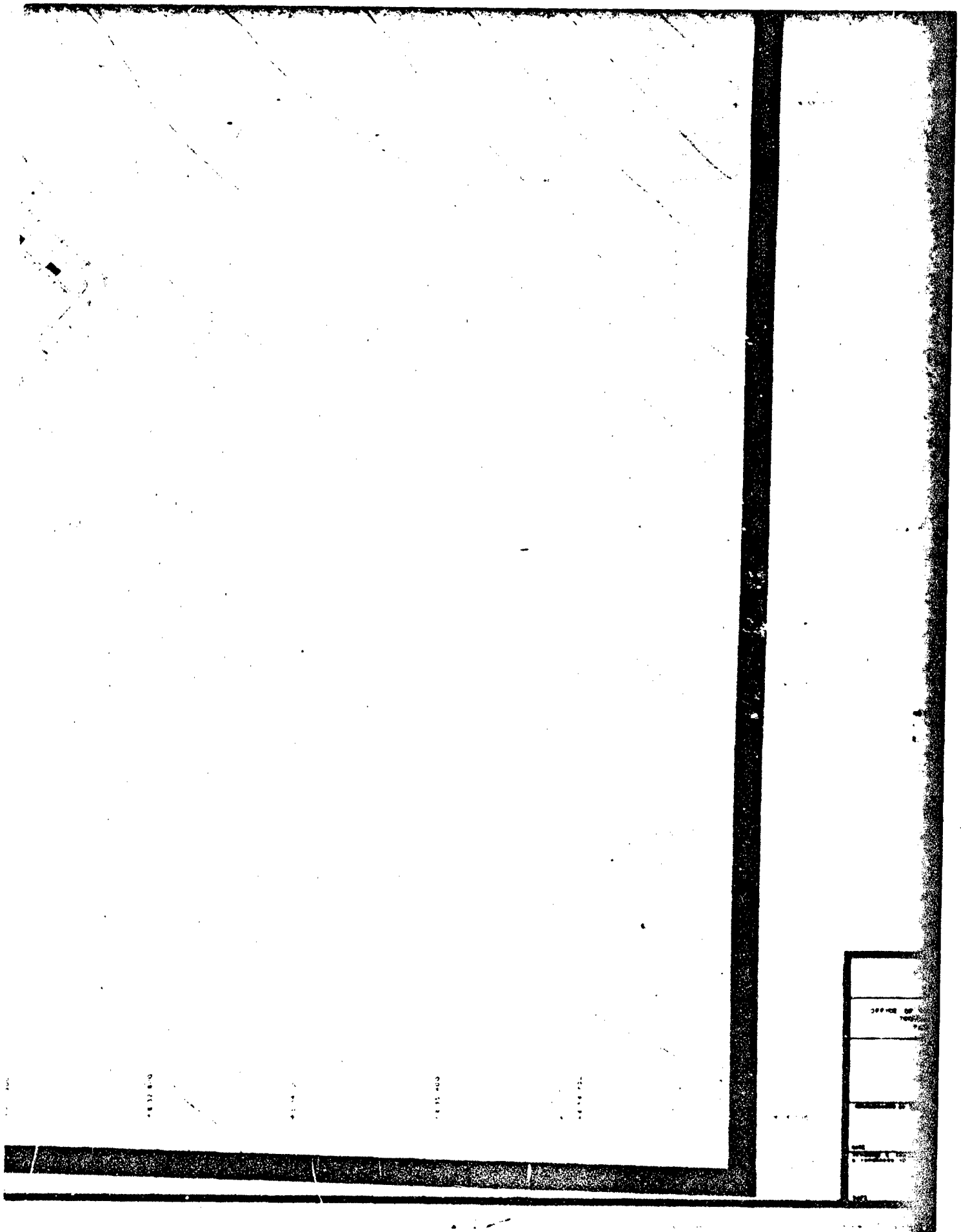
- 18,100

+ 18,200

+ 18,700

+ 19,000



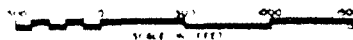


OFFICE OF
THE
SECRETARY OF
DEFENSE
WASHINGTON, D.C.

ON-SITE INSPECTION HAS BEEN COMPLETED FOR ENVIRONMENTAL, HISTORICAL, ECONOMIC, AND OPERATIONAL CONSIDERATIONS FOR EACH PROPOSED ITEM.

Dennis E. Simpson
 DENNIS E. SIMPSON
 Chief, Depot Facilities Division

- NOTE:
1. THIS AREA IS NOT LOCATED IN ANY KNOWN FLOOD PLAIN.
 2. NO HISTORICAL PLACES NOTED ON THIS SHEET.



TOOELE ARMY DEPOT		
SOUTH AREA TOOELE UTAH		
OFFICE OF THE FACILITIES ENGINEER TOOELE ARMY DEPOT TOOELE, UTAH		
MASTER PLAN FUTURE DEVELOPMENT PLANS GENERAL SITE PLAN AREA 6		
<div style="text-align: right;"> <i>James A. Peterson</i> JAMES A. PETERSON, JR., M.D. ARCHITECT </div>		
<small>DESIGNED BY</small> <small>DATE</small> <small>BY</small>	<small>DATE</small> <small>BY</small>	<small>DATE</small> <small>BY</small>

10

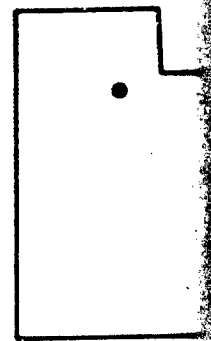
4

TOOELE ARMY DEPOT

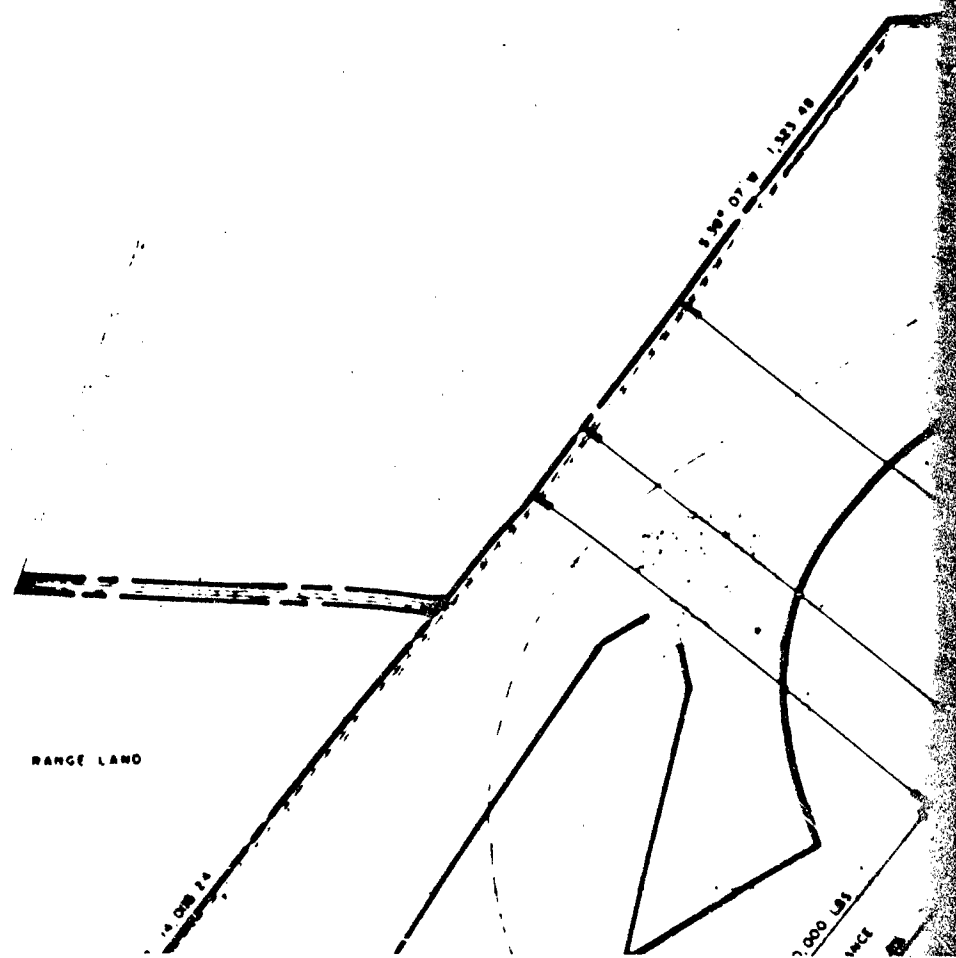
NORTH POST

Figure 1-4 LAND USE

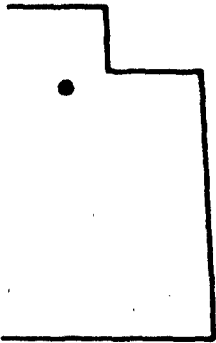
1-



UTAH MAP LOCAL
SALT LAKE CITY



2



TAH MAP LOCATOR
SALT LAKE CITY

RANGE LAND

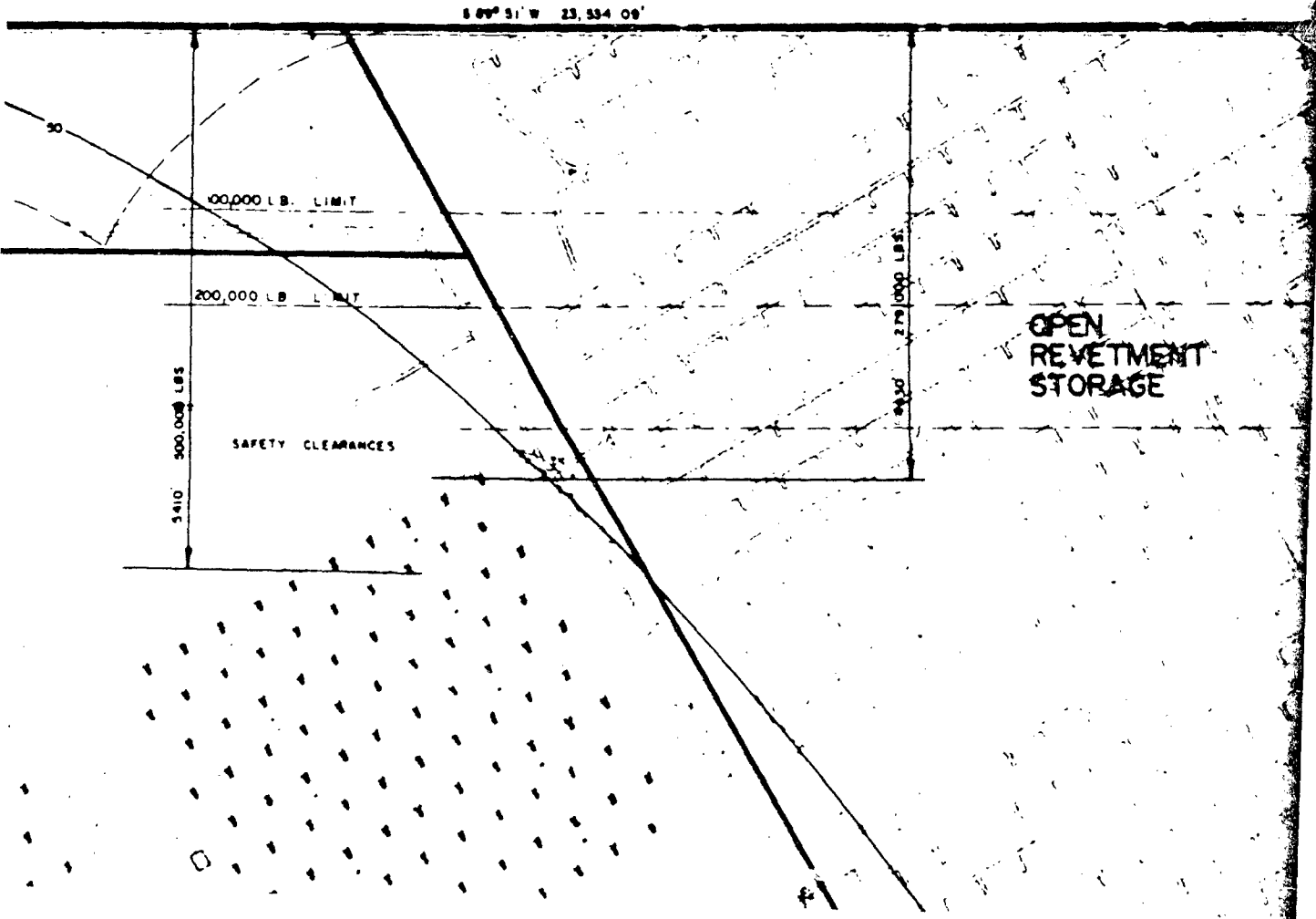
S 89° 51' W 4.205.0

BUFFER AREA

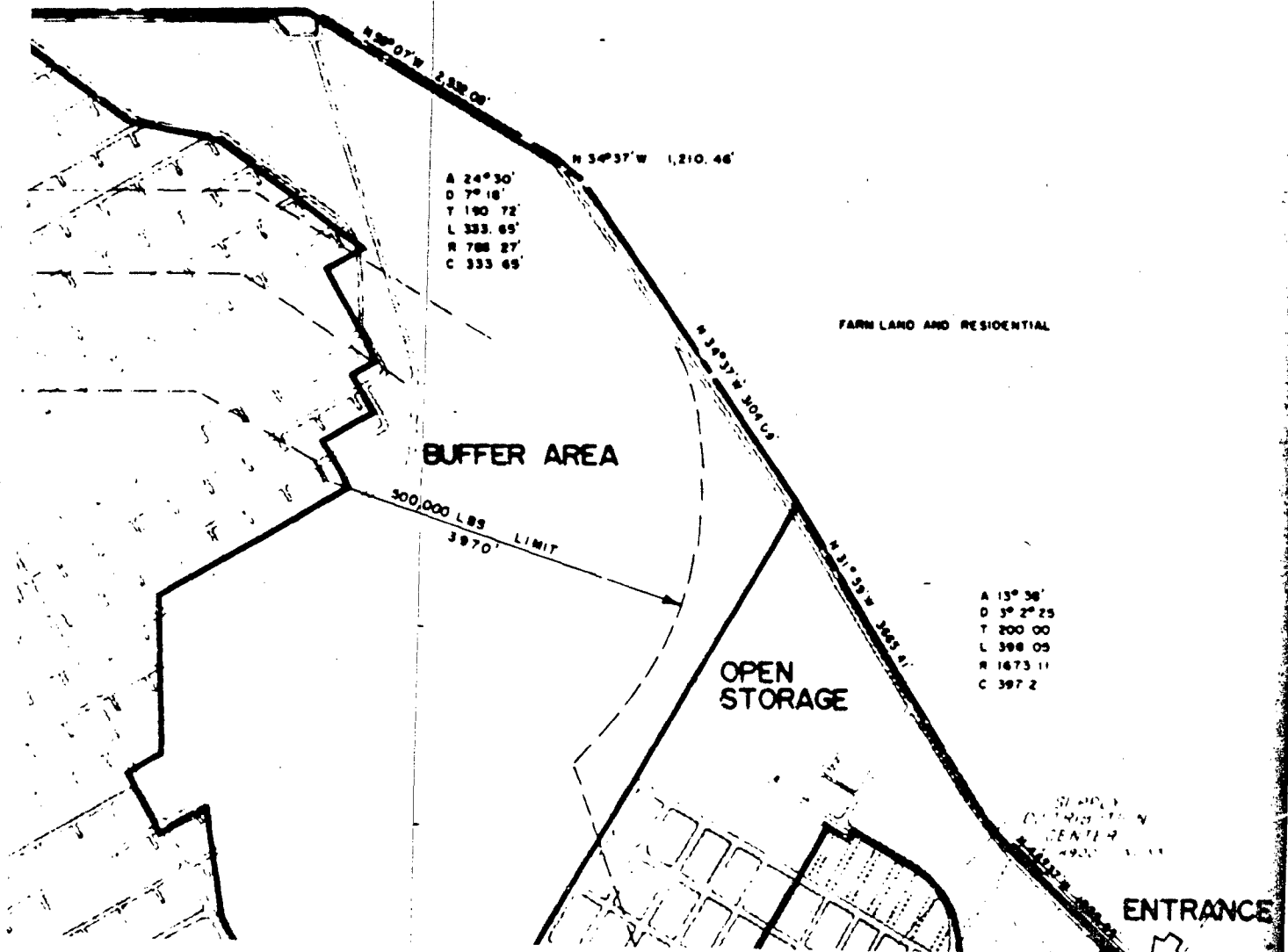
500,000.0 LIMIT
3970



3



**Figure 1-4. LAND USE
TOOELE ARMY DEPOT - M**



5

**LAND USE MAP FOR
POT - NORTH POST**

METES AND BOUNDS ARE COMPILED FROM DESCRIPTIONS.
RESERVATION CONTAINS 24,728 ACRES.

5

RANGE LAND

51°0'35" 30" 20" 20"

51°0'28" 30" 10" 265 20" 32°0'10" 10" 1044 0 51°0'35" 30" 4134 8

E 4 000'

RIFLE
RANGE
(7.62mm)

4780 300,000 LBS
SAFETY CLEARANCE
3410 300,000 LBS

3000,000
3970'

1176
20,000 LBS

RANGE LAND

51°12' E 2,700'

AMMO. DEMOLITION

2400'

IGL
ST

3,000,000 LBS. LIMIT
3970'

AMMO
MAINT.

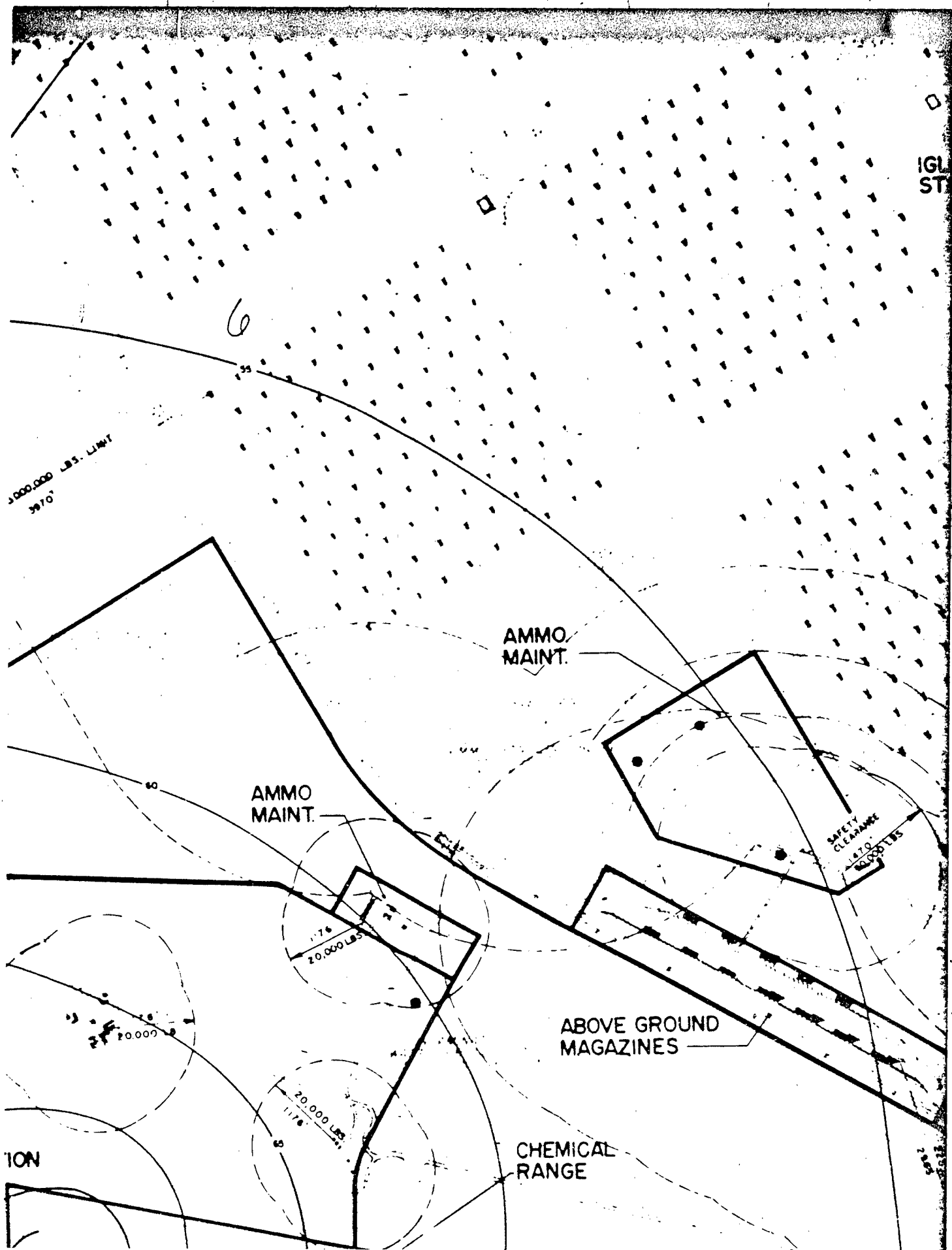
AMMO
MAINT.

SAFETY
CLEARANCE
1670'
20,000 LBS

ABOVE GROUND
MAGAZINES

CHEMICAL
RANGE

ION



IGLOO
STORAGE

500,000 LB CLASS III

200,000 LB CLASS III

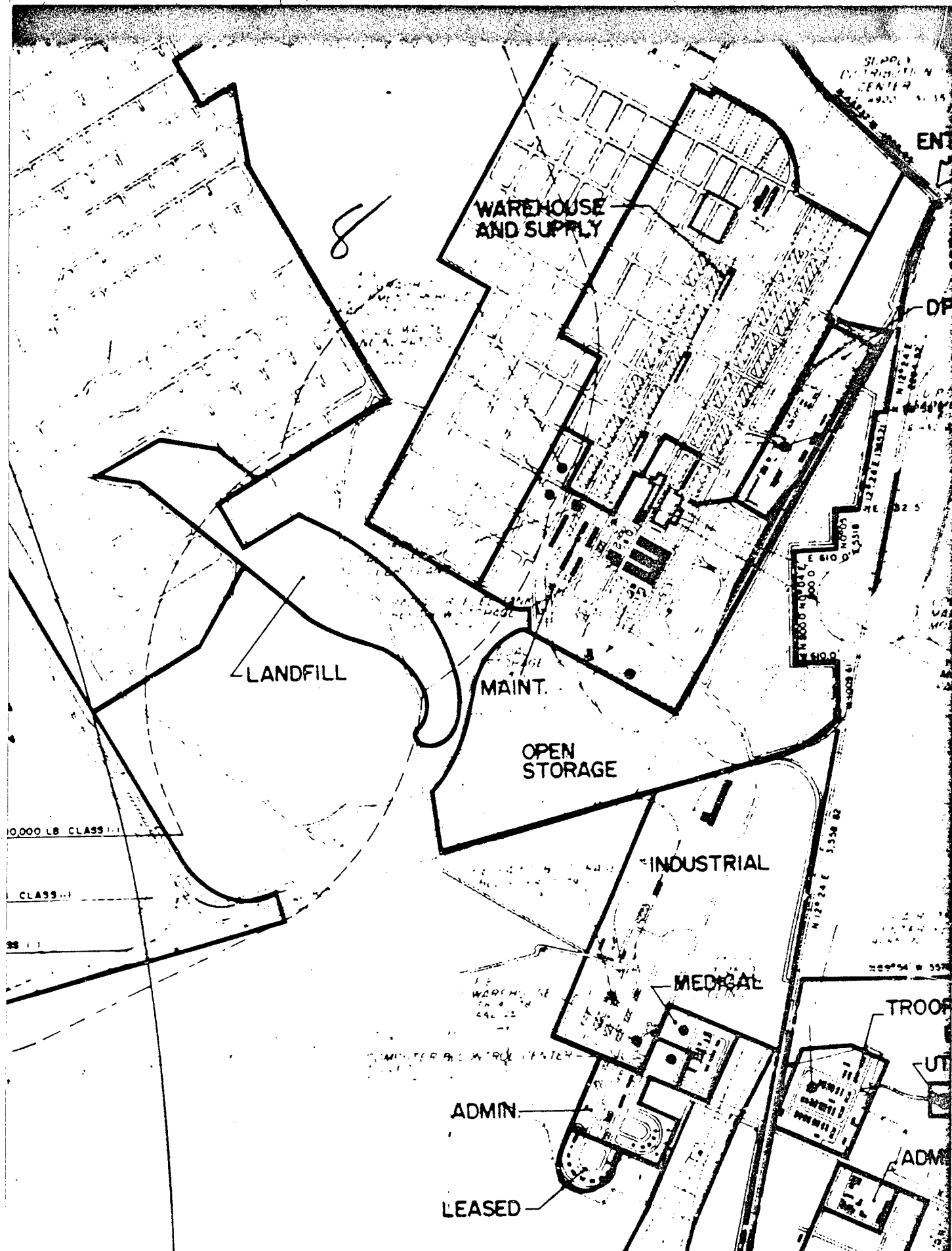
AMMO
MAINT

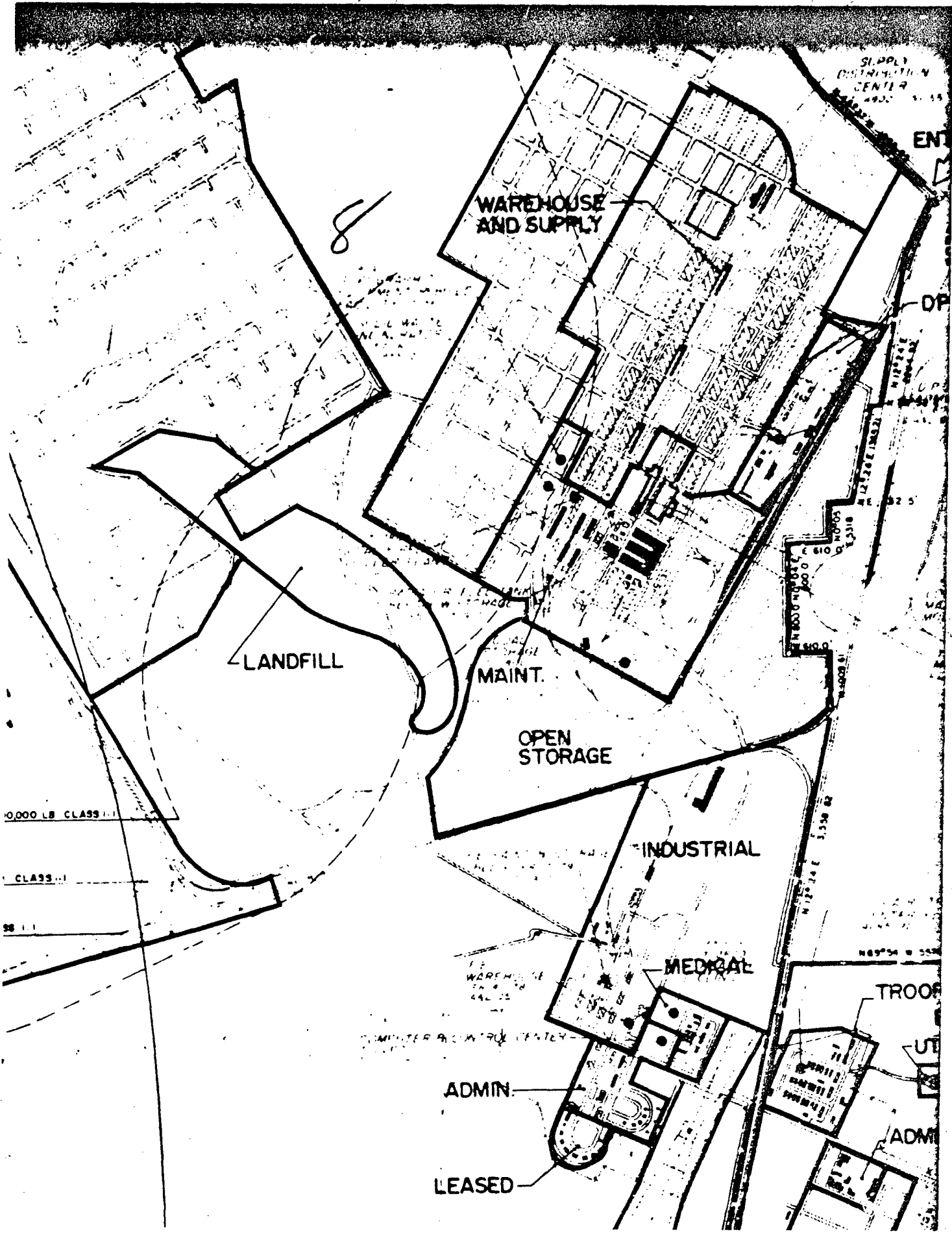
100,000 LB CLASS III

SAFETY
CLEARANCE
865
10,000 LBS

BUFFER AREA

225,000 LBS





SUPPLY DISTRIBUTION CENTER

WAREHOUSE AND SUPPLY

LANDFILL

MAINT.

OPEN STORAGE

INDUSTRIAL

MEDICAL

ADMIN.

LEASED

TROOP

ADM

WATER PUMP CENTER

0.000 LB CLASS I

CLASS II

SS I

10.1
1.170 N
11.2
1.170 N

METES AND BOUNDS ARE COMPILED FROM DESCRIPTIONS.
RESERVATION CONTAINS 24,728 ACRES

ENTRANCE

A 25° 04' 30"
D 2° 54'
C 865.72
R 1960.08

DPDO YARD

32.5

4 3576.54

ROOP HSG. AND SUPPT
BUFFER AREA
UTILITY SERVICES



ADMIN.

38 30' 20 20'

E 4 000'

RANGE LAND

S 1° 12' E 2700'

S 0° 41' E 2303 0

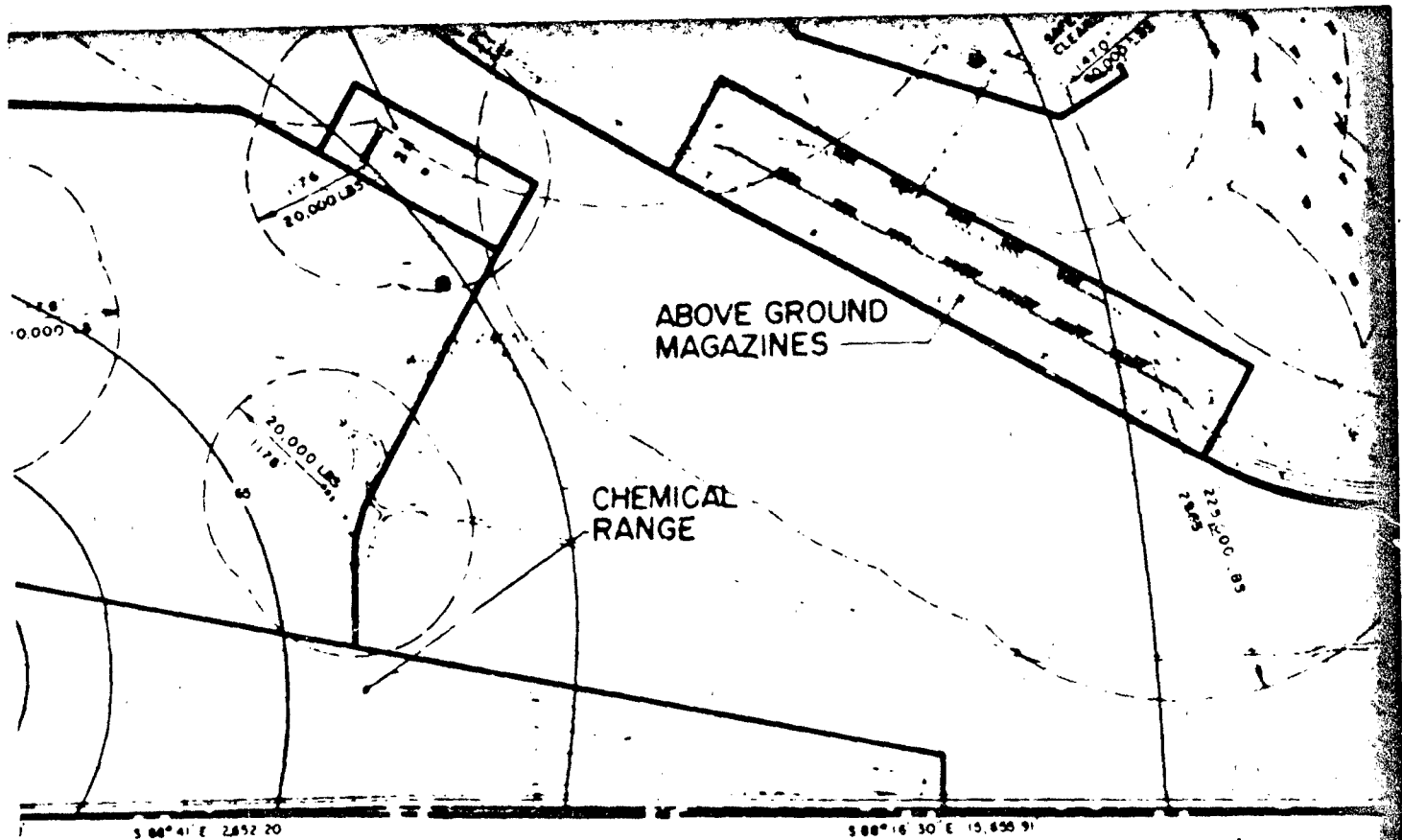
N 82° 56' E 2944 96

N 82° 47' E 2792 80

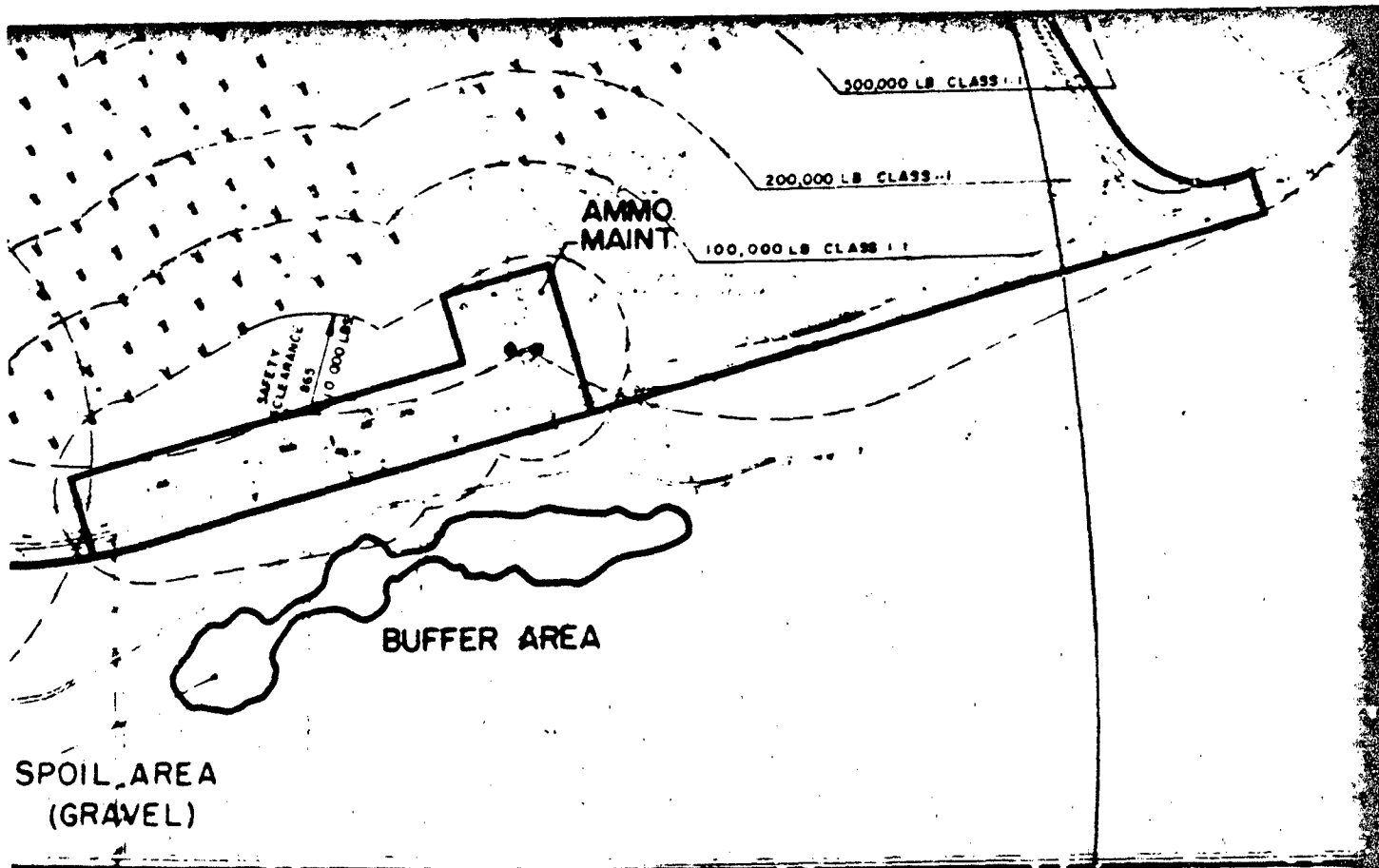
N 89° 35' E 2825 20

AMMO. DEMOLITION

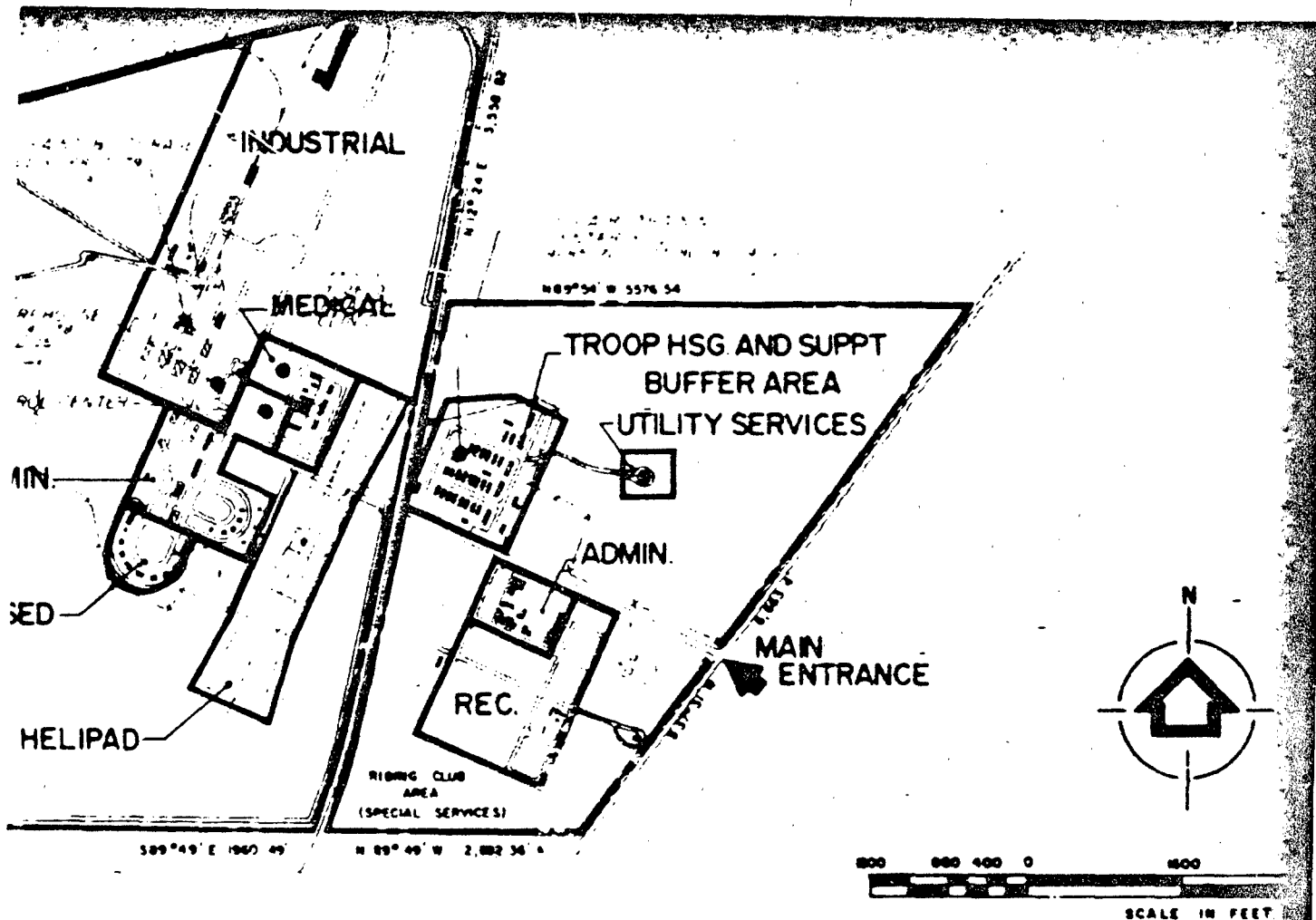
THE CHEMICAL RANGE IS NOT BEING USED
THE FIRING RANGE EXTENDING OFF THE
ALL FIRING OF CHEMICALS ARE DONE AT
DEPOT ACTIVITY



USED DUE TO
E RESERVATION
AT PUEBLO



RANGE LAND



TOOELE ARMY

TOOELE, UTAH

ROBERT G. MUIR & ASSOCIATES
ARCHITECTS & PLANNERS
COLORADO SPRINGS, COLORADO 80903

MASTER PLAN
PLANS FOR FUTURE DEVELOPMENT
GENERAL SITE

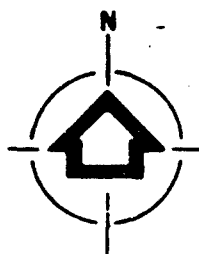
DATE **AUG. 1982**

REVIEWED & COMMENTED ON BY MAJOR COMMANDER
& FORWARDED TO THE CHIEF OF ENGINEERS

MAJOR
COL
COMMANDER

MSG. AND SUPPT
DIFFER AREA
ITY SERVICES

MAIN
ENTRANCE



SCALE IN FEET

CONTOUR INTERVAL 20 FEET

TOOELE ARMY DEPOT

TOOELE, UTAH

ROBERT G. MUIR & ASSOCIATES
ARCHITECTS & PLANNERS
COLORADO SPRINGS, COLORADO 80903

U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA 95814

MASTER PLAN
PLANS FOR FUTURE DEVELOPMENT

GENERAL SITE PLAN

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL

[Signature]
HARRY B. KARESEANNA

COL, ONDC

COMMANDING

DATE AUG. 1982

DESIGNED BY: [blank]
CHECKED BY: [blank]
FORWARDED TO THE CHIEF OF [blank]

DATE
SEPT 1982

DRAWING NO
18-04-01

SHEET NO
4 of 28

FILE NO

Table 1-1. NORTH POST LAND USE

<u>Use</u>	<u>Acres</u>	<u>Hectares</u>
1. Igloo Storage Area	9,930	4,018
2. Open Revetment Storage Area	2,890	1,170
3. Open Storage Areas	730	295
4. Buffer Areas	6,705	2,714
5. Ammunition Demolition	1,605	650
6. Ammunition Maintenance Areas	310	125
7. Above-ground Magazines	130	53
8. Chemical Range	380	154
9. Rifle Range	930	376
10. Spoil Area	55	22
11. Landfill	115	47
12. Warehouse and Supply Area	345	140
13. Maintenance Area	195	79
14. DPDO Yard	35	14
15. Industrial Area	220	89
16. Administrative Areas	50	20
17. Medical Area	20	8
18. Troop Housing and Support Area	30	12
19. Recreational Areas	50	20
20. Utility Services Area	5	2
TOTAL	24,730	10,008

The spoil area is a repository for excess and unsuitable soil material. The landfill is located south of the warehouse and supply areas and is used to dispose of non-toxic and uncontaminated solid waste materials.

Ten warehouses within the warehouse and supply area are used for long-term specialized vehicle storage. The warehouses have controlled humidity and a series of metal tanks with sealed doors which allow a controlled atmosphere. The supply area has 26 warehouses for additional storage of equipment and supplies. A modern tank repair facility is located to the north. The area is served by both truck and rail.

The maintenance area has 877,776 ft² (81,545 m²) of building space which accommodates paint dunnage, equipment maintenance, repair, inspection, and ammunition handling. The area is served by truck and rail.

The DPDO yard, adjacent to the eastern side of the warehouse and supply area, consists of an open storage area and several steel buildings. This yard is used for temporary storage of surplus material and is served by rail and truck.

The industrial area consists of several warehouse structures for Depot maintenance support activities including buildings and grounds; planning and administrative functions; electrical, utilities, and sanitation systems maintenance; automotive, rail, and mobile equipment maintenance; pest control; and tool cribs. The area east of the supply and maintenance road and the eastern depot boundary is undeveloped.

There are two administrative areas used for general Depot administrative support functions. The headquarters area, adjacent to and south of the industrial and medical areas, contains the fire station, a community club, and an officers' housing area. The other administrative area, in the southeast corner of the Depot, houses the security division and other administrative functions.

The medical area is a complex of buildings that house the Depot health facilities.

The troop housing and support area, used for troop housing during reserve forces training, contains 25 two-story barracks, five mess halls, and an administrative building. The reserves also use the rifle range and two maneuver areas located west of the main administrative area and between the Ethiopian Dam and chemical firing range. No permanent facilities are located within these maneuver areas.

The major recreational area is in the southeast corner of the Depot. The NCO Club, credit union, travel club, and other facilities are located within this area. A gymnasium and pool are adjacent to this use area. Other recreational facilities are located in other parts of the installation.

The utility services area contains one of the Depot's water tanks.

1.2.2 South Post Land Use

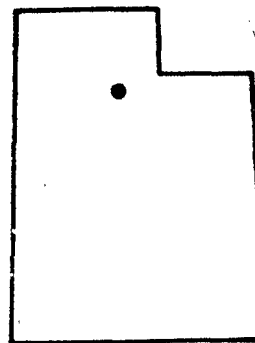
Land use and activity areas on South Post are illustrated on Figure 1-5. Table 1-2 lists these land uses and the approximate acreage associated with each.

The open storage and ammunition area, located in the central portion of the Depot, is the largest of the identified land use areas. It consists of open pad storage, warehouses, and off-load facilities. Rail and truck service is available and the southwestern portion of the area is undeveloped.

TOOELE ARMY DEPOT

SOUTH POST

Figure 1-5 LAND USE



UTAH MAP LOCATOR
SALT LAKE CITY

2

SPOIL AREA

IGLOO TOXIC STORAGE AREA

3

BUFFER AREA

CEMETERY



4

SERVICE
AREA

SERVICE
AREA

PRIVATE HOUSING AREA

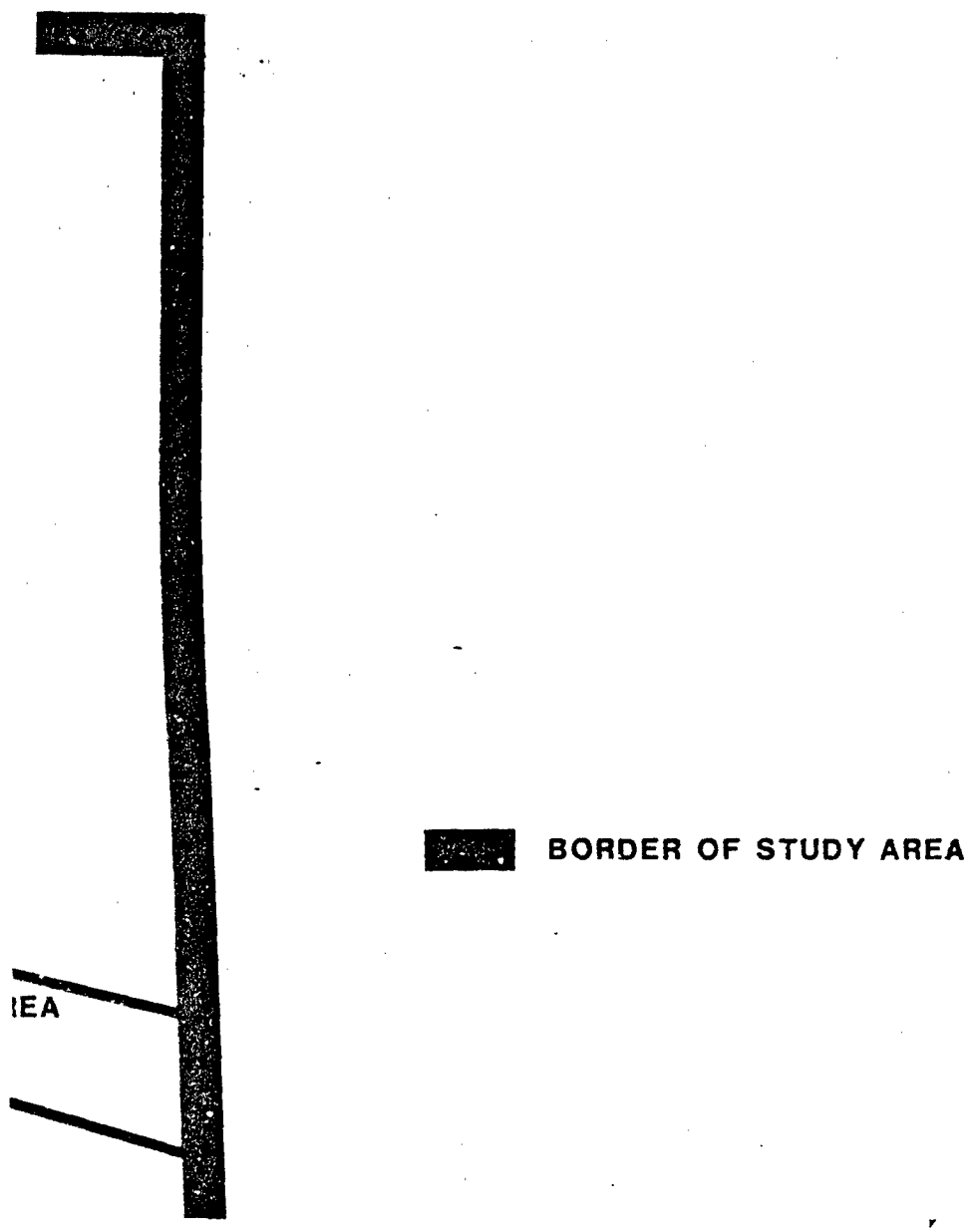
GRAZING AREA

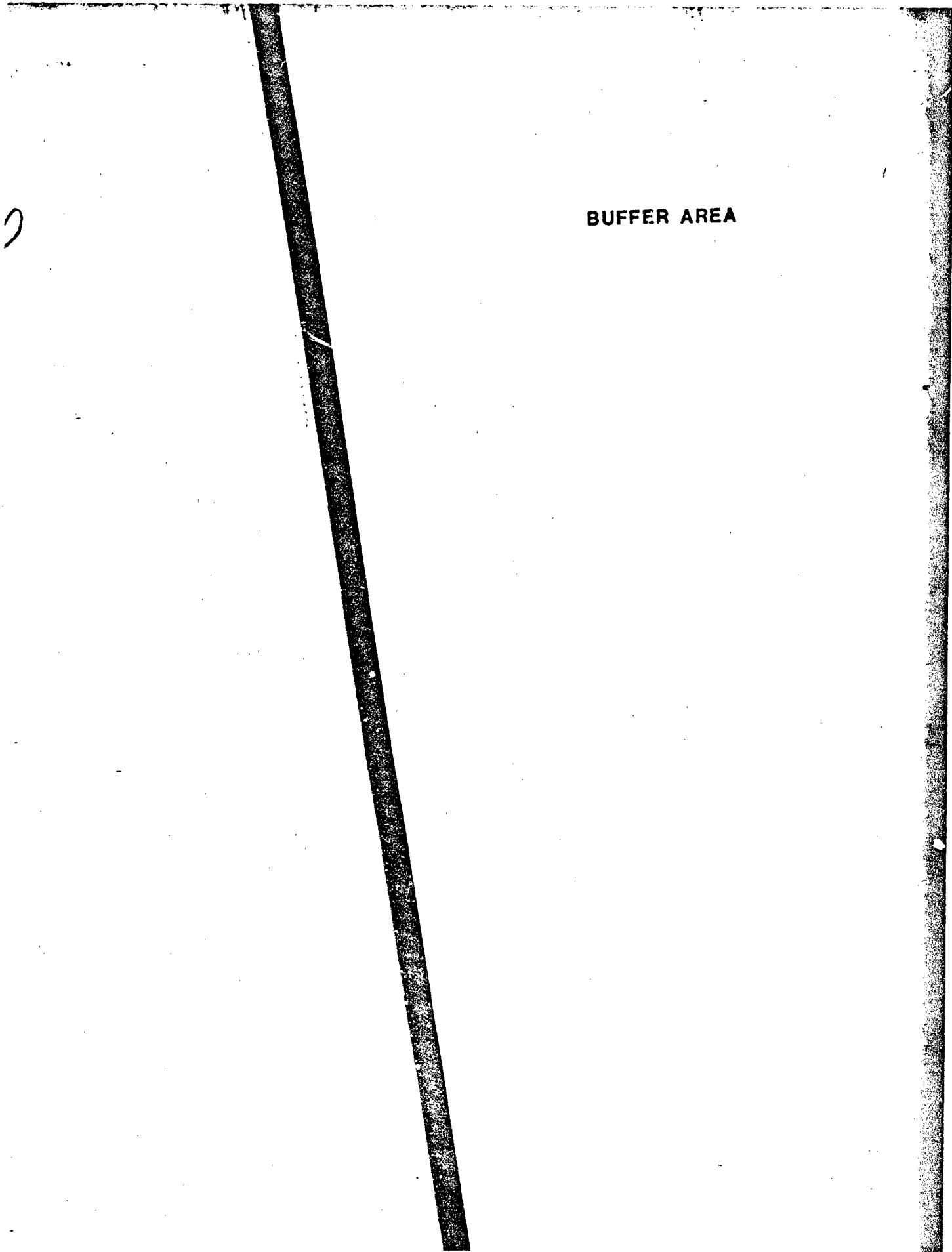
ADMINISTRATION, SHOPS AND
WAREHOUSE AREA

LANDFILL A

5

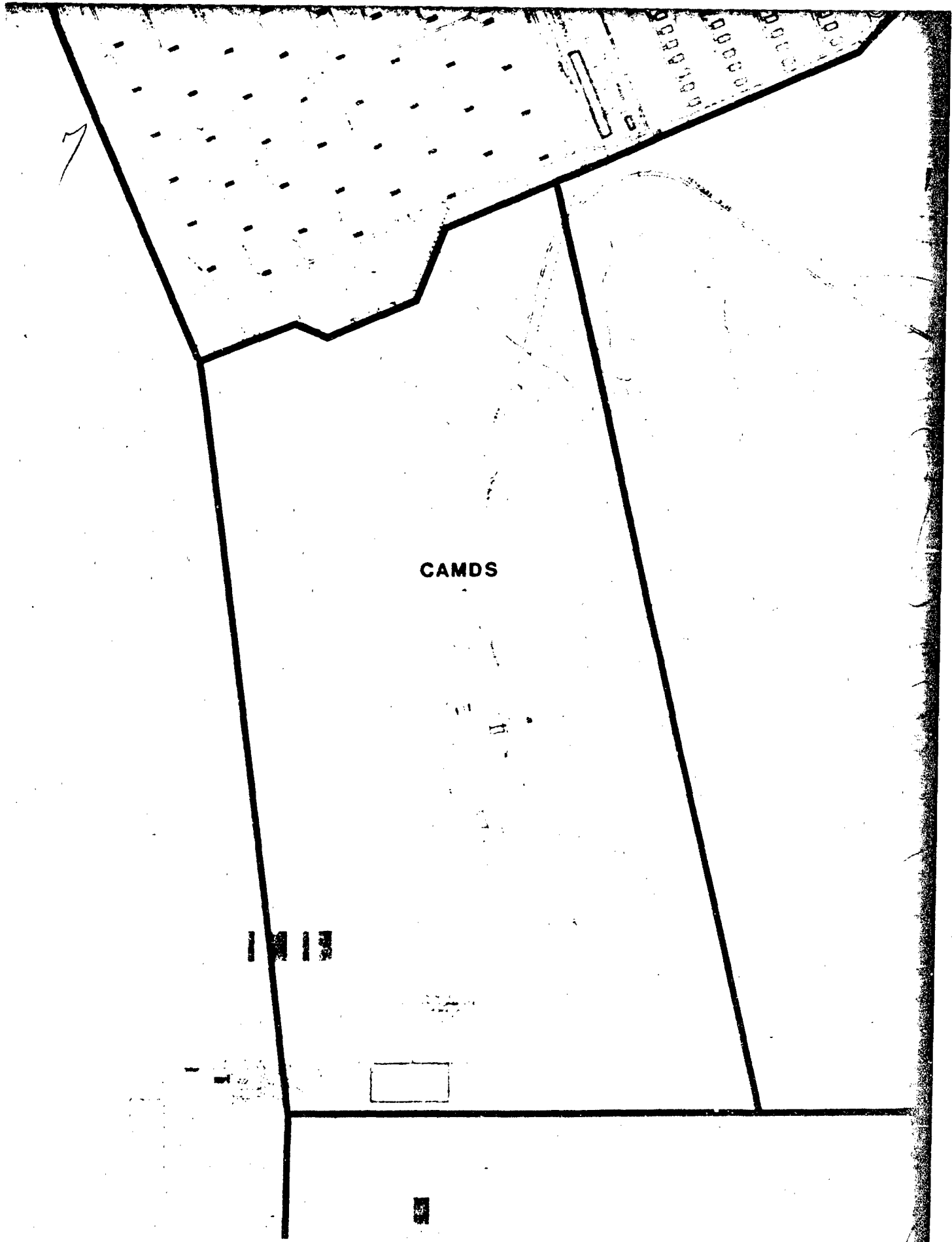
**Figure 1-5. LAND USE MAP FOR
TOOELE ARMY DEPOT - SOUTH POST**





BUFFER AREA

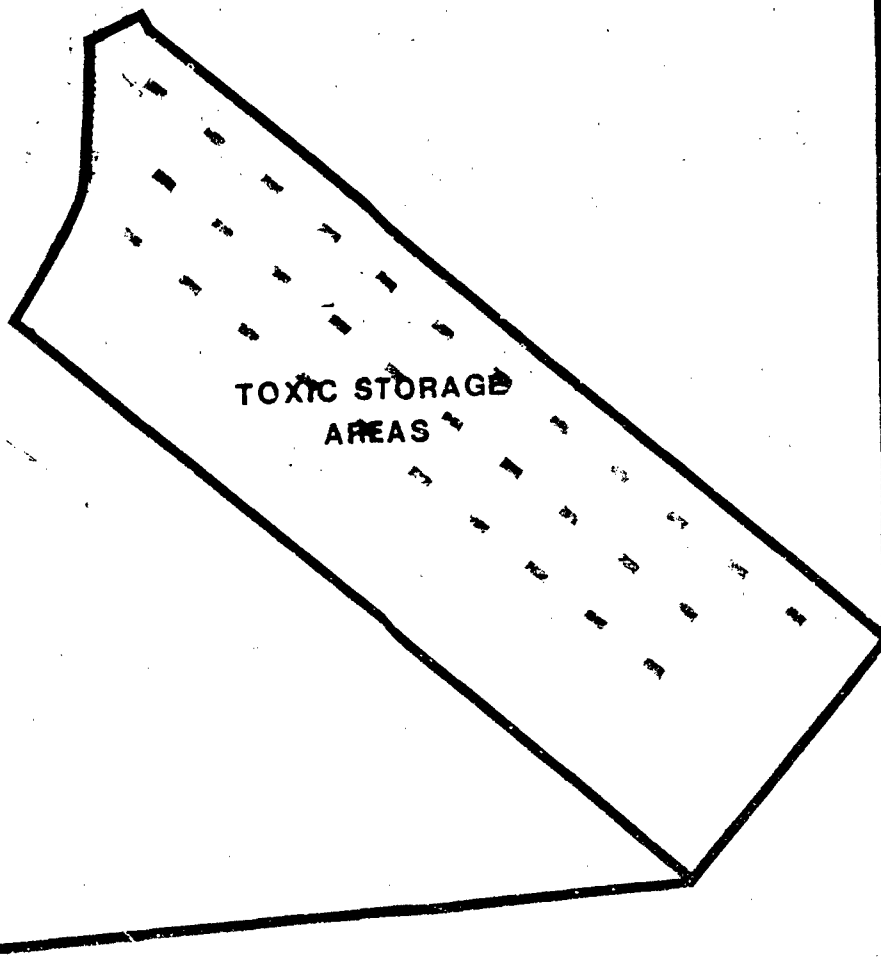
2

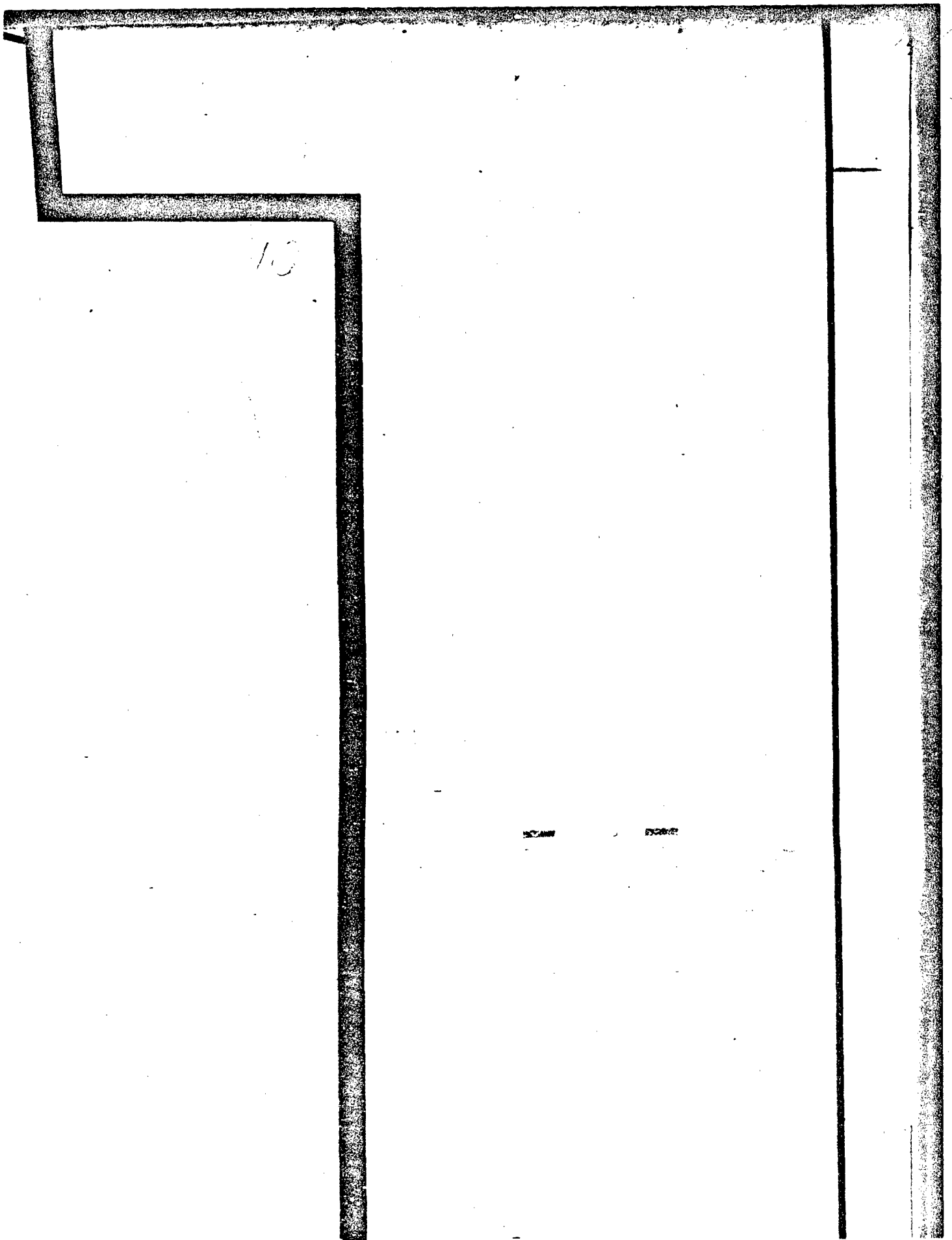


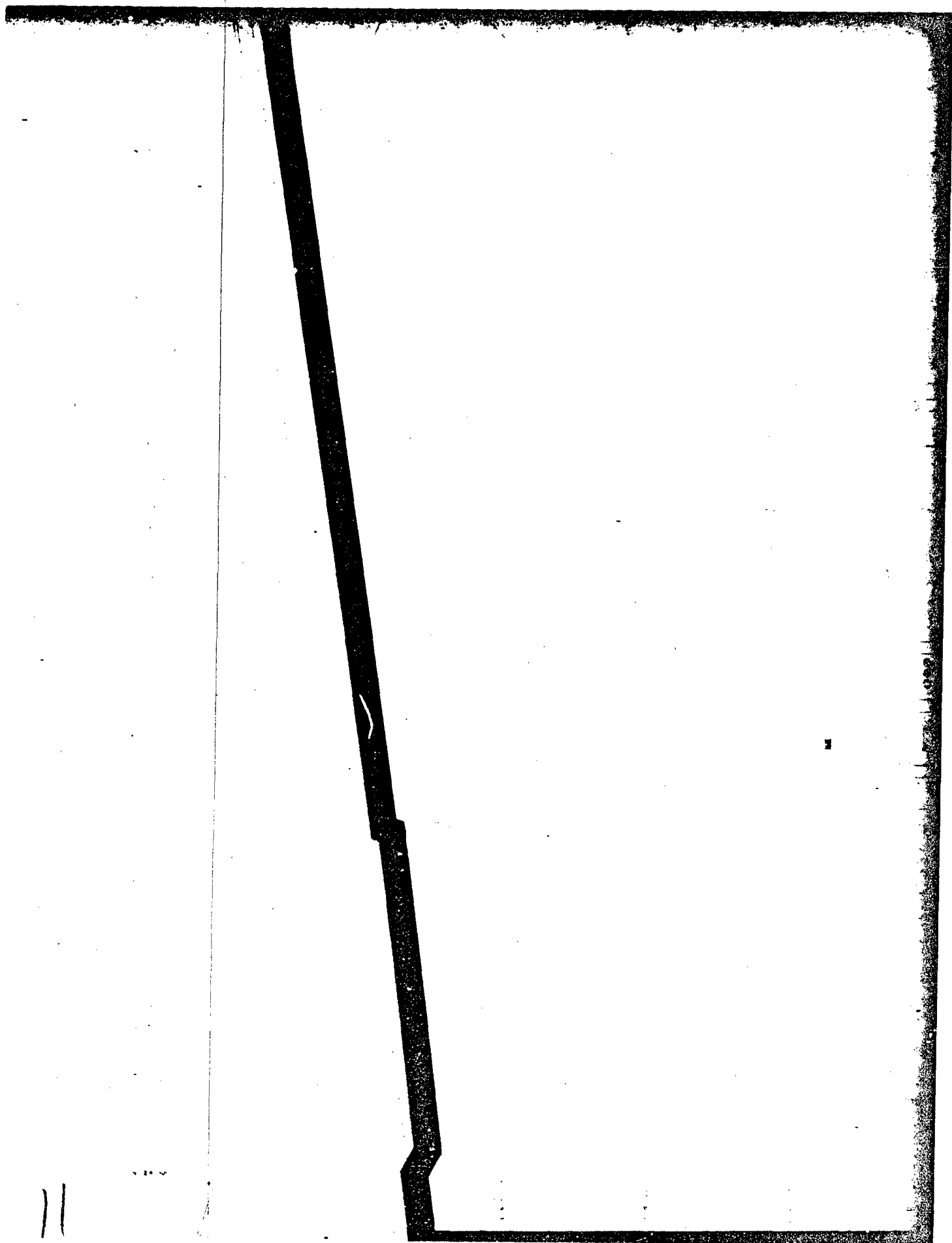
8

OPEN STORAGE AND AMMUNITION AREA

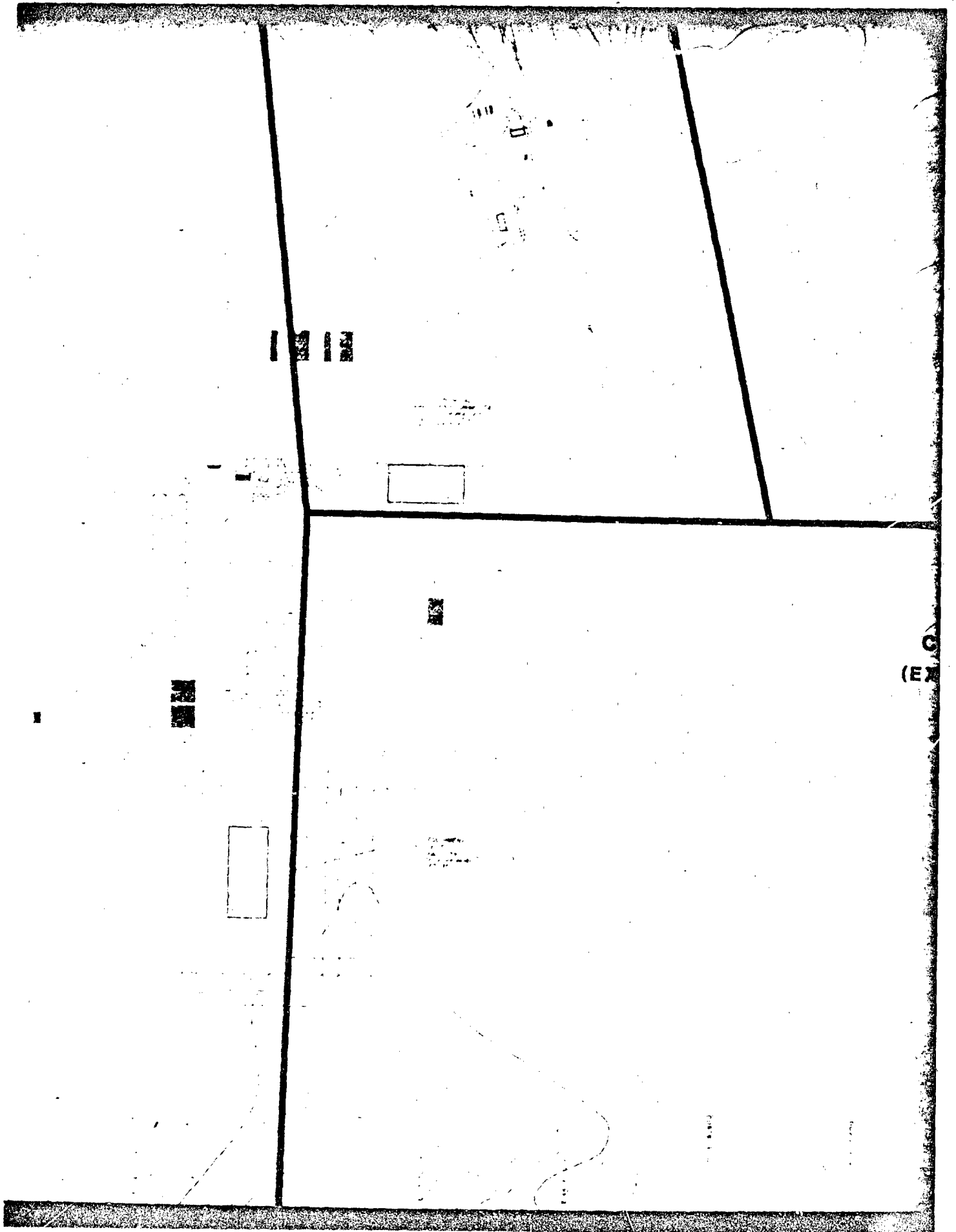
9







11





**CONTAMINATED AREA
(EXPLOSIVE & CHEMICAL)**

TOXIC STORAGE
AREAS

BUFFER AREA

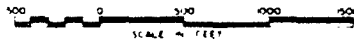
LEGEND

	PROPOSED DEVELOPMENT
	EXISTING DEVELOPMENT
	PROPOSED ROAD
	EXISTING ROAD
	PROPOSED WATERWAY
	EXISTING WATERWAY
	PROPOSED UTILITY
	EXISTING UTILITY
	PROPOSED STRUCTURE
	EXISTING STRUCTURE
	PROPOSED FENCE
	EXISTING FENCE
	PROPOSED BOUNDARY
	EXISTING BOUNDARY

ON-SITE INSPECTION HAS BEEN COMPLETED FOR ENVIRONMENTAL, HISTORICAL, ECONOMIC, AND OPERATIONAL CONSIDERATIONS FOR EACH PROPOSED ITEM.

Dennis E. Bingham
DENNIS E. BINGHAM
Chief, Depot Facilities Division

- NOTE
1. THIS AREA IS NOT LOCATED IN ANY KNOWN FLOOD PLAIN
 2. NO HISTORICAL PLACES NOTED ON THIS SHEET



TOOELE ARMY DEPOT

SOUTH AREA TOOELE UTAH

OFFICE OF THE FACILITIES ENGINEER
TOOELE ARMY DEPOT
TOOELE, UTAH

MASTER PLAN FUTURE DEVELOPMENT PLANS GENERAL SITE PLAN

AREA 6

DESIGNED BY THE ARMY OFFICE PLANNING BOARD AND OFFICIALS

James A. Bingham
JAMES A. BINGHAM, JR., 2024
ARCHITECT

DATE
REVISED & FORWARDED TO THE CHIEF OF ENGINEERS

124 NOVEMBER 1956
16-54-52

Table 1-2. SOUTH POST LAND USE

<u>Use</u>	<u>Acres</u>	<u>Hectares</u>
1. Open storage and ammunition area	4,348	1,760
2. Igloo toxic storage area	1,151	466
3. Toxic storage area	235	95
4. CAMDS area	700	283
5. Contaminated area (buried explosives and chemicals)	1,934	782
6. Spoil area	443	179
7. Landfill area	54	22
8. Abandoned landfill area	7	3
9. Administration, shops, and warehouse area	755	306
10. Service areas	54	22
11. Private housing area	26	11
12. Grazing areas	830	366
13. Buffer areas	8,822	3,570
14. Cemetery	5	2
TOTAL	19,364	7,837

The igloo toxic storage area, located adjacent to the northwestern portion of the open storage and ammunition area, has 140 reinforced-concrete standard construction magazines and 68 steel arch magazines. All igloos are earth-covered; concrete igloos provide approximately 300,000 ft² (27,870 m²) of storage area, and the steel arch igloos provide approximately 150,000 ft² (13,935 m²). Rail and truck transport serve this area.

The toxic storage area has 32 storage structures and is located in the southeast corner of the open storage and ammunition area. A rail and street system serve the area.

The chemical agent munitions disposal system (CAMDS) area, adjacent to the igloo and open storage areas in the west central portion of the Depot, is used for demilitarization of chemical munitions and storage containers and the detoxification of nerve agents and mustard agent fills. This activity is limited to a complex of structures enclosed within a 10-acre fenced site. The CAMDS use area is undeveloped, with the exception of a newly constructed structure outside of the fence to the south, and the facility itself. The facility is served by rail and street system and a helipad is adjacent to the area.

The contaminated area (buried explosives and chemicals) is located between the CAMDS facility, the open storage and ammunition area, and the southern Depot perimeter fence. This area consists of former demolition and burying areas, mustard holding areas, a mortar pit, and numerous other covered pits.

The spoil area, located along the central portion of the northern boundary, is a repository for excess and unsuitable soil material. The existing landfill area is located southeast of the administration and warehouse area. It is used for disposal of general sanitary waste materials. An abandoned landfill area is located southwest of the administration and warehouse area.

The administration, shops, and warehouse area is located in the northeast corner of the Depot. Aside from CAMDS, this is the major activity area on the South Post. The developed portion, located in the southwestern corner, contains warehouses, a dispensary, administrative facilities, a fire station, other personnel support facilities, a boiler plant, and maintenance facilities. The administrative, warehousing, and maintenance functions are on a considerably smaller scale than those at the North Post.

Service areas are located within the northwestern portion of the South Post and to the northwest of the administrative, shops, and warehouse area. They consist of wells and reservoir sites.

The private housing area, located in the northeast portion of the South Post, consists of 26 units (13 structures) of privately-owned housing.

The grazing areas, located north of the open storage and ammunition area and west of the administration area, is undeveloped and leased to private individuals for cattle grazing.

Buffer areas, which make up the greatest acreage on the South Post, are located along all Depot boundaries. They are non-use areas intended to buffer the munitions storage and activity areas.

The Johnson cemetery is located in the north central portion of the depot. It is fenced and graveled.

1.2.3 Contaminated Areas

There are numerous contaminated areas in the North and South Posts listed in the Installation Environmental Assessment (Inland Pacific Engineering Company 1982), with associated maps. Pages 35 and 36 of the Installation Environmental Assessment discuss the extent of ground disturbance that has occurred on the Post. The degree of contamination will greatly affect the consideration of cultural resources in the management plan.

The North Post demolition and burning grounds are located in the extreme southwest corner of the installation. Activities conducted at this site since 1942 include explosives demolition; burning of explosives and explosive-contaminated materials; demolition or burning of white phosphorous (WP) filled munitions; and burning of riot-control agents and munitions.

Explosive demolitions are conducted against a ridge several hundred ft. high. All types of conventional ammunitions are destroyed here, from small arms up to 12,000-pound bombs. The WP demolition area is on the east side of the ridge, against which the demolition pits are dug.

The present landfill at the South Post was opened in 1976. Prior to this, several sanitary landfills were operated along the south boundary of the shops and warehouse area, west of the present landfill. Approximately 1 ton of solid waste per day is deposited at the present landfill.

A spoil area located along the northern boundary of the South Post is used for the disposal of excess and unsuitable excavated soil material.

An unlined drainage pond, located east of building 600 in the South Post, received wash-down waste from High Explosives (HE) cluster bombs during the late 1940s and early 1950s.

Sewage disposal also is a possible source of contamination. The South Post contaminated area is served by a gravity-flow collection system, and removed sludge is buried at the landfill. In 1980 a lagoon was added to the system to catch effluent leaving the tank. Most wastewater entering the lagoon seeps into the ground, leaving potential for groundwater contamination.

1.2.4 Tooele Army Depot Railroad (AD-RR) Maintenance Facility

The AD-RR facility consists of 28 acres (11.3 hectares) within Hill Air Force Base and is described and discussed separately in the supplement to this report.

1.3 SUMMARY OF PREVIOUS ARCHEOLOGICAL WORK CONDUCTED ON THE TOOELE ARMY DEPOT

A review of inventory files in the Office of the Utah State Archeologist and the Salt Lake District Office of the Bureau of Land Management (BLM), and the NRHP revealed that a major archeological effort was conducted between 1930 and 1933 prior to establishment of the military reservation. According to Steward (1933:19), "Scattered for several miles along the former channels

of North and South Willow creeks, about 5 miles from the present lake shore and within a few hundred ft. on each side of the streams, where Tooele Valley slopes down from the Stansbury (mountains), were probably, at one time, two hundred pit house sites. All but a few have been destroyed by marauders." In this report, Steward identified nine mound groups in all. Of the nine, five are located on-post. These include "houses" 3, 4, 5, 6, and 9. Steward describes (1933:12-14) these houses as follows:

Site No. 3. On South Willow Creek, approximately 18 ft. square; the floor basin-like and very uneven, being 2 ft. 3 in. below the ground level in the center and sloping up on the sides to 1 ft. 2 in. below ground level. The edges of the pit sloped at about 30 degrees from horizontal. Possibly 8 to 10 in. of soil have covered the ground since the house was built. One hole, probably for a post supporting the roof, was in the northwest corner, and possibly another in the southwest corner. Gopher holes made original holes difficult to distinguish. The mound comprised burned roof adobe, and charred logs on which lay small sticks and layers of burned grass or thatch, and some baked adobe lumps containing burned thach in the impressions made when the moist adobe was first applied. There were no traces of a doorway.

A burial in the northwest corner ran partly out of the house; head south, on its back, the right arm flexed over the chest, the left arm extended by the side, the knees bent but not flexed over the abdomen. The grave bottom was 3 ft. below ground level or 1 ft. 6 in. below the house floor. No artifacts accompanied the burial, but two figurine fragments occurred on the floor south of and within a foot of the head.

Site No. 4. A "cache" of charred corn, buried about 2 ft. 6 in. deep, apparently not directly associated with any house, was within a hundred yards of the last. This was evidently a storage cache. Previous digging made the shape, probably basin-like, difficult to ascertain.

Site No. 5. South Willow Creek, the house was approximately 19 ft. square; the floor was of comparatively level, smooth, and hard-packed adobe; the pit walls vertical with rounded corners, adobe-plastered to a height of 1 ft. 6 in. above the floor, probably originally being plastered to ground level. The central fireplace was circular, 3 ft. by 3 ft. 3 in. outside diameter, the adobe rim being 6 to 9 in. wide and 2 to 3 in. high. A post, 5 in. in diameter, supporting the roof, formerly stood in the southeastern corner 12 in. above the floor. Its 6-in. diameter butt was set 16 in. deep, the lower end being burned, probably in felling the tree. A similar post 5 in. in diameter, burned off at the floor, had stood in the southwest, northwest, and undoubtedly northwest corners. Burned roof beam fragments lay on the floor. Artifacts included: a coiled basket fragment with rod and bundle foundation; a pit with "finger-nail" decorations; a plain, wide-mouthed pot; no burials.

House No. 6. About a mile upstream from the last, in a group of about 8 houses, near the upper limit of the village. Constructional features had been destroyed on account of the shallowness of the pit. Burned roof adobe was abundant. Near the southern side were crushed remains of nine pots.

House No. 9. A group of perhaps 6 houses is about three-eighths of a mile south of the group containing Nos. 3, 4, and 5, on an old channel of South Willow Creek. Though previously dug over by a local citizen, and originally but 8 in. deep and therefore nearly disintegrated, a clearly marked floor, roughly 17 to 18 ft. square could be followed. A southeastern post, 4 in. in diameter, was partially in position, about 4 ft. from each wall. Traces of the other 3 posts were suggested. The central fireplace was unrimmed, 6 in. deep and unique in being rectangular, 3 ft. north-south, 2 ft. 7 in. eastwest. Artifacts included: sherds, fragments of a plain bowl of unbaked clay (partially burned by the fire which destroyed the house), several figurine fragments.

Steward's finds constitute one large village site exhibiting internal clusters, not a series of independent archeological sites.

1.4 THE SOCIOCULTURAL CONTEXT OF THE ARCHEOLOGICAL RESOURCES ON THE TOOELE ARMY DEPOT

Archeological resources on the Tooele Army Depot have the potential to produce extremely useful information of a scientific nature dealing with human settlement, locational preferences, and social structure of the prehistoric Fremont peoples as well as the Historic Gosiute. Further, if any of the mounds described above are intact, there is the possibility of recovery of Fremont ceramics and figurines, thus furthering archeological understanding of Fremont art and religious life. Currently, only the "house-mounds" described above are known to exist on the Depot. However, any additional sites located on the Depot would also make a major contribution to our understanding of the prehistory of the region.

SECTION 2

CHAPTER 2.0 AN OVERVIEW OF THE CULTURAL AND RELEVANT NATURAL HISTORY OF THE TOOELE ARMY DEPOT

2.1 THE PHYSICAL ENVIRONMENT

2.1.1 Earth Resources

Topography. Tooele Army Depot is comprised of two facilities located in north central Utah. The North Post, which contains 24,732 acres (10,009 hectares), lies at the southern end of Tooele Valley, 8 miles (12.8 km) south of the Great Salt Lake. The South Post, which contains 19,364 acres (7837 hectares), is located 12 miles (19.3 km) further south in Rush Valley. Both valleys are broad, gently sloping sedimentary basins largely surrounded by steep, fault-block mountain ranges.

Tooele Valley is bounded on the east and west by the Oquirrh and Stansbury Mountains, respectively, on the south by South Mountain, and on the North by the Great Salt Lake. Elevations in the Oquirrh Mountains reach 10,620 ft. (3237 m), 11,031 ft. (3362 m) in the Stansbury Mountains, and the summit of South Mountain is 6597 ft. (2011 m). The Valley is about 20 miles (32.2 km) long and averages approximately 15 miles (24.1 km) in width. It rises from 4200 ft. (1280 m) on the Salt Flats in the north, to around 5200 ft. (1585 m) at the toe of South Mountain at its southern end, where the North Post is sited. Facility elevations are greatest, approximately 5200 ft. (1585 m) at the southwest and southeast corners, and from there slope gently northward toward the Valley center, reaching about 4400 ft. (1341 m) at the northern site boundary.

Slopes are mostly 0.5 to 2 percent, but become pronounced along Box Elder Wash in the southwest corner where slopes of up to 25 percent rise abruptly by as much as 150 ft. (46 m). The facility is crossed by three intermittent drainages, Box Elder Wash, South Willow Creek on the northwest, and an unnamed drainage on the northeast.

Rush Valley is bounded by the Oquirrh Mountains on the east, the Stansbury and Onaqui Mountains on the west, South Mountain to the north, and the Sheeprock and Tintic Mountains to the south. The highest elevations are found in the Stansbury and Oquirrh Ranges bordering the northern valley. Mountain ranges ringing the remainder of Rush Valley generally rise to maximum elevations of 8000 to 9000 ft. (2438 to 2743 m). The Valley extends approximately 30 miles (48.2 km) north to south, and averages 15 miles (24.1 km) in width. The northern two-thirds of the valley generally lie at about 5000 to 5200 ft. (1524 to 1585 m) elevation, but rise to 5800 ft. (1768 m) at its southern end. The South Post is located in the northern third of the valley at the foot of the Oquirrh Mountains. Surface topography of the facility is gentle, with elevations mostly between 5000 and 5200 ft. (1524 to 1585 m), rising to 5500 ft. (1676 m) in its northwest corner. Slopes vary from almost flat in the southwest corner to moderate (up to 10 percent) in the northwest corner. Ophir and Mercur Creeks, and several intermittent drainages enter the site from the Oquirrh Mountains on the east, and generally drain to the southwest. Due to the flat terrain, drainage is poor on the west side of the facility, resulting in a playa covering portions of the southwest corner (Inland Pacific Engineering Company 1982).

Geology. The North and South Posts are located in the eastern portion of the Great Basin Physiographic Province and the Basin and Range Geologic Province. They are approximately 35 miles (56.3 km) west of the Wasatch Fold and Fault Belt of the Overthrust Geologic Province which forms the eastern boundary of the Basin and Range Geologic Province. The Basin and Range Geologic Province is characterized by large en echelon fault blocks bounded by "down-on-the-west" normal faults that trend approximately north to south. In addition, the effect of Tooele and Rush Valleys' proximity to the Overthrust Belt has produced an east-west and southeast thrustfault trend characterized by the North Oquirrh and Sheeprock Thrust Systems. These traces are hidden largely by valley pediment and lacustrine sediments. Movement along the faults has been extensive since the late Miocene epoch with hundreds to thousands of feet of displacement in places. This has allowed for large interior draining basins to form between fault blocks, which in turn developed extensive alluvial and lacustrine deposits within the basins (Hintze 1975).

The Tooele Army Depot is located in a large interior draining basin (Great Salt Lake Basin), bounded on the north and east by the Great Salt Lake and Oquirrh Mountain fault block, on the south by the Sheeprock and Tintic Mountain fault blocks, and on the west by the Stansbury Mountains fault block. Displacement along the control faults has been extensive, exposing rocks ranging in age from Pre-Cambrian and Cambrian (approximately 600 million years ago) to Tertiary and Quaternary. Interspersed within these rocks are igneous (volcanic) rocks of geologically recent age (Tertiary) intruded into the fault block mountains simultaneously with fault displacement (Moore and Sorenson 1979).

Alluvial and lacustrine sediments found between the fault block mountains were deposited as pediment slopes from mountain drainage courses and lake bed deposits in the large intermountain Lake Bonneville of the late Tertiary Period. These deposits are horizontal or nearly so, very thick, little affected by the Miocene faulting, and generally contain deep salt or fresh water aquifers. Surface springs are common near the mountain fronts or within the mountain ranges, rather than within the alluvial valleys or lake bed deposits, with the exception of springs located on recent faults hidden by valley sediments, because the watertable deepens towards the basin axis (Moore and Sorenson 1979).

The development of sediments filling the intermountain basins spanned the Pliocene-Pleistocene epochs. The most significant deposition of sediments occurred during the great Pleistocene Pluvial (lake forming) periods. These lake forming episodes are attributable to the simultaneous glaciation of the Rocky Mountain Cordillerian and Canadian Shield areas when temperatures were lower than present (as much as 12.6°F (7°C) lower) and precipitation may have been greater than present (Miller 1982). The result of these climatic changes produced the fossil Lake Bonneville, evidenced by the multiple shoreline terraces in and around the mountains of the Great Salt Lake Desert. These terraces, which may only be remnants of many lake forming episodes, consist of four distinct deposits: the Bonneville Terrace at an elevation of approximately 5175 ft. (1577 m); the Provo Terrace at an elevation of approximately 4815 ft. (1416 m); the Stansbury Terrace at an elevation of approximately 4525 ft. (1379 m); and the present Great Salt Lake Stand at an approximate elevation of 4200 ft (1280 m).

Estimations place the formation of the Bonneville Terrace during or prior to the Illinoian glacial advance or during the earliest Wisconsin glacial advance (called the Iowan advance), the Stansbury Terrace formation during the Tazewell or Cary advances of the Wisconsin glaciation, the Provo Terrace formation during the very last advance of the Wisconsin, called the Mankato-Cochrane at 12,000 years Before Present (BP), and the Great Salt Lake Stand formation during the Holocene. Pre-Bonnevillian terraces have been more difficult to date accurately (Jennings 1957, Flint 1971).

The economic geology of the Tooele and Rush Valleys is more significant than other areas around Salt Lake City, partially due to nearness to major urban centers and natural mineral occurrences. Extensive intrusive porphyry and fractured Paleozoic sedimentary rocks within the Oquirrh Mountain fault block have contributed major tonnages of low grade disseminated copper, gold, silver, and other metallics, and sulfur and other byproducts. Extensive, dispersed deposits of lead, mercury, zinc, and beryllium also occur in faulted hydrothermal and disseminated vapor phase deposits in the Oquirrh and Tintic Mountains. Alkali, salt, building rock, and aggregate have been extracted and processed to serve the needs of the surrounding urban areas. Ground water also has been exploited extensively in the Tooele and Rush Valleys to serve the needs of urban, agricultural, and mineral expansion or development.

Soils. Soil characteristics within Tooele and Rush Valleys largely result from the past inundation of the valley bottoms by Pleistocene lakes. Increasing amounts of salt were deposited in the soils of Great Basin valleys by drying lakes in the Holocene era. Today the valley bottoms tend to be saline, the middle slopes slightly saline, and the upper parts of the valleys non-saline.

The North Post has mostly deep soils which are arable and non-saline (Wilson et al. 1975). However, the soils are generally low in fertility and are farmed only under irrigation. Four general soils groups occur on the facility (Inland Pacific Engineering Company 1982). Group one is a relatively thin loamy soil over either gravel or a sand and gravel mixture. It covers 43 percent of the site, on slopes of 1 to 5 percent on the higher eastern and western parts of the facility. Group two is a deep loam or silty loam overlying silty or gravelly clay loam. These soils are moderately saline and alkaline, exhibit some gullyng under native conditions, and may be poorly drained. They occupy one-fourth of the site, mostly in lower portions of the northern site and extending up drainages. Group three are medium textured deep loams over a loam subsoil, covering 8 percent of the site. Group four soils are deep sandy loams, occupying 25 percent of the site, mostly in the center. They are highly susceptible to wind erosion, and experienced heavy erosion and devegetation in the 1930s.

Group two soils have high water erosion potential, while the remainder have moderate water erosion potential. About 1600 acres (648 hectares) have been overcovered or used for open storage. Additional areas may have been impacted during the facility's operation by compaction, mechanical disruption, or contamination.

Most of Rush Valley is slightly saline, with strongly saline soils in the center (Wilson et al. 1975). However, they are considered arable or potentially arable with drainage (Wilson et al. 1975). Soils on the South Post are predominantly Neola gravelly loam (Inland Pacific Engineering

Company 1982). These are shallow soils, with a lime-cemented, gravelly hardpan within 20 in. (51 cm) of the surface and gravelly loam underneath. They are moderately saline and alkaline, especially in the subsoil. Soils on the southern and western boundaries are deep silty clay loams, and silt loams of alluvial flood plains and valley floors, are saline and alkaline, and have low permeability. The higher alluvial fans, on the northern and eastern boundaries have very deep, well-drained silt loams, gravelly loams, and gravelly clay loams. Although the soils generally are arable or potentially arable, due to low natural rainfall, they are rarely farmed in the region except under irrigation. The facility is predominately used as rangeland. A small area of deep silt loam soils near Ophir Creek was under cultivation prior to construction of the Depot (Anonymous 1982b). As with the north site, portions have been disturbed by construction and operation of the facility.

2.1.2 Water Resources

Neither the North or South Posts currently have perennial surface water, except for sewage lagoons. Water flow in drainages that cross the sites normally occurs only after snowmelt or heavy rains.

There are five perennial streams in Tooele Valley, with a combined water yield of about 13,930 acre ft. ($17.2 \times 10^6 \text{ m}^3$) per year (Razem and Steiger 1981). Two of these originate in the central Oquirrh Mountains and enter the valley near the town of Tooele, and three originate in the central Stansbury Mountains on the west side of the valley. Two of these three cross the North Post; however, their perennial flow is diverted before reaching the boundary, and is intermittent and normally dry on the study area. South Willow Creek is on the north-western boundary and is the largest of the streams in the Tooele Valley, with an annual flow of 4830 acre ft. ($6 \times 10^6 \text{ m}^3$). Box Elder Wash has an annual flow of 900 acre ft. ($1.1 \times 10^6 \text{ m}^3$) and enters the site in the southwest, crossing from south to north. There are also four large springs in the central Tooele Valley several miles north and northeast of the facility boundary. Their combined flow is about 17,000 acre ft. ($2.1 \times 10^6 \text{ m}^3$). A few minor seeps also occur in the basin, but none on the study area.

There are eight perennial streams in Rush Valley; three are in the northern part of the basin and one, Ophir Creek, enters the South Post (Hood et al. 1969). Water from Ophir Creek is diverted for agricultural use prior to entering the site at the northeast corner and generally has little or no flow into the study area (Inland Pacific Engineering Company 1982). Intermittent drainages that occasionally carry some water onto the facility include Mercur Creek, West Dip Gulch, and other unnamed drainages, all from the Oquirrh Mountains. The playa and other low areas on the valley bottom in the western and southwestern portion of the site may be flooded in years of heavy runoff (Anonymous 1982b, Hood et al. 1969).

2.1.3 Modern Climate

The South Post's climate is semi-arid and continental, characterized by hot dry summers, moderately cold winters, and cool springs and falls.

Temperatures decrease and precipitation increases with elevation, from the valley floors into adjacent mountains.

The average annual precipitation at the North Post is 12 to 16 in. (30 to 41 cm), while at South Post it is between 10 and 12 inches (25 to 30 cm). Precipitation in Tooele Valley varies considerably due to rainshadow effects and elevation changes. At the town of Tooele, precipitation is 16.65 in. (42.29 cm) per year, while the average at Grantsville, 8 miles (12.9 km) northwest and 600 ft. (183 m) lower, is about 11 in. (28 cm) (Inland Pacific Engineering Company 1982, Anonymous 1978). St. John, 5 miles (8 km) west of the South Post, has an annual precipitation of only 9.16 in. (15.65 cm) (Anonymous 1982b). Precipitation in the higher mountains is as much as 40 in. (102 cm) per year (Hood et al. 1969:8). The summer months normally are dry with occasional showers or thunderstorms. Most of the moisture comes during fall, winter, and spring, as a result of moist, maritime polar air masses (Inland Pacific Engineering Company 1982).

Temperatures at the North Post range from an average 28.9°F (-1.7°C) in January to 74.2°F (56.4°C) in July, with recorded extremes of 102°F (84°C) and -14°F (-25°C) (Anonymous 1982b). Temperatures at the South Post are cooler; average monthly temperatures at St. John range from 22 to 70°F (4 to 52°C), and recorded extremes are 110°F and -36°F (92°C and -54°C). The average frost-free period is 168 days at Tooele, only 98 days at St. John due to cold air drainage, and probably 130 days on the higher slopes of the alluvial apron in Rush Valley (Hood et al. 1969).

Year-round evaporation rates are several times higher than precipitation due to the semi-arid climate and high summer temperatures. Measured rates at Saltair on the Great Salt Lake and at Lehi near Utah Lake show evaporation of 57 in. (145 cm) and 43 in. (109 cm), respectively, from a free water surface (Hood et al. 1969). Vegetation typically shows primary growth in spring and early summer when the soil is moist from winter precipitation.

Prevailing winds in Tooele Valley are from the north-northwest. However, due to the pronounced elevation changes, the typical diurnal pattern is one of classic terrain induced flow, e.g. downslope at night and upslope during the day. This local wind circulation is intensified by the Great Salt Lake and becomes the predominant wind pattern in the basin, with velocities rarely exceeding 10 mph (16.1 kph). In Rush Valley, prevailing winds are northerly in winter and southerly in summer (Inland Pacific Engineering Company 1982). The local wind circulation is not influenced by the Great Salt Lake, but typical drainage flow patterns are to be expected. Occasional dust storms may occur (Brown 1960, Anonymous 1982b).

The area characteristically has low humidity and good visibility year-round. However, during winter, invading polar air masses may create strong subsidence inversions as a result of deep, cold air trapped in the valleys, thus creating significant fog and smog problems (Brown 1960, Inland Pacific Engineering Company 1982).

2.1.4 Plant Resources

The Depot is in the northern desert shrub biome (Fautin 1946), with most of the North Post in the sagebrush-grass zone and most of South Post in the shadscale and salt desert zones. Tooele and Rush Valleys are typical of many intermountain valleys, exhibiting a series of concentric rings of

vegetation from the valley center to the mountains, based on tolerances to soil salinity and aridity differences (Cronquist et al. 1972). In the Tooele Valley, the lower areas near the Great Salt Lake are unvegetated salt flats, with pickleweed and glasswort. With increasing elevation, grass flat, greasewood-shadscale, shadscale, and sagebrush communities are found in succession (Kearney et al. 1941). Various foothill, montane, and subalpine communities occur in the nearby mountains.

The North Post vegetation is described according to range site by Inland Pacific Engineering Company (1982). The foothill and upland loam range sites occur on the higher portions of the installation and are in the sagebrush-grass zone. Grasses are dominant over much of this area; major species include bluebunch wheatgrass, western wheatgrass, needle and thread, Indian ricegrass, Sandberg bluegrass, and cheatgrass, and introduced annual weeds. Common forbs include arrowleaf balsamroot, sweet vetch, and silvery lupine. Typical shrubs include big sagebrush, low sagebrush, and yellowbrush. Sandy hills in the center of the site exhibit the most diverse communities in Tooele Valley (Kearney et al. 1941). Dominant species include Utah juniper, big sagebrush, low sagebrush, Mormon tea, shadscale, needle and thread, Indian ricegrass, bluebunch wheatgrass, and sand dropseed. The lower elevations in the northern part of the facility are a saline desert bench range type. The lowest sites are dominated by greasewood, shadscale, and gray molly. Higher sites are dominated by winter fat, budsage, Indian ricegrass, and western wheatgrass.

The South Post is more arid, has more saline soils, and the vegetation is sparser, less productive, and less diverse (Inland Pacific Engineering Company 1982). The natural vegetation includes black sagebrush, fringed sage, and shadscale on the higher eastern part of the site; greasewood, rubber rabbitbrush, Nuttall saltbush, and alkali sacaton on the valley floor in the southern and western parts; and winter fat, black sagebrush, and shadscale in the middle areas. Shrub height is typically 12 to 15 in. (30 to 38 cm) taller along drainages. A few juniper trees occur near the higher eastern boundary along the foothills, and a few willows and poplars occur along Ophir Creek. An unvegetated playa occurs on the southern boundary of the site, and together with adjoining areas of phreatophytes (greasewood and rubber rabbitbrush) occupies about 20 percent of the area (Hood et al. 1969).

Large portions of both facilities are covered with buildings and roads or manmade vegetation communities such as areas seeded to introduced grasses, irrigated horticultural plantings, and weed communities on disturbed areas. The remaining natural vegetation has been modified by livestock grazing and other causes since Euro-American settlement of the area.

Lists of wild food plants used by aboriginal peoples are available from ethnobotanical studies of the Gosiute and Shoshone (Chamberlin 1909 and 1911, Steward 1970, Yanovsky 1936) and from archeological studies (Coulam and Barnett 1980, Hogan 1980, Jennings 1978, Harper and Alder 1970). The Tooele Valley was a population center of the Gosiute (Steward 1938) and had varied plant food resources available from mountains, marshes, wet meadows, grasslands, and shrublands. The North Post might have been significant for grass seeds or other food resources, but the South Post was probably not an important plant food collection area.

Principal food resources of the sagebrush-grass zone included arrowleaf balsamroot seeds and greens, roots of sego lily and wild onion, and seeds of

common sunflower, tumble mustard, false tarragon, greennell spp., and numerous grass species. In the salt desert areas, shadscale and herbaceous species of *Chenopodium* and *Atriplex* produced large quantities of edible seeds. Important root and fruit-producing plants were collected in the nearby mountains. Wet meadows and riparian areas along South Willow Creek and Box Elder Wash provided concentrations of grasses and sedge seeds, and other plant resources. Numerous other species were used for tools, medicine, or fuel by aboriginal peoples.

2.1.5 Animal Resources

Vertebrate species occurring in the North Post include 40 mammal species, 214 bird species, 8 reptile species, and one amphibian species (Inland Pacific Engineering Company 1982). The South Post has fewer species and lower populations due to greater aridity and sparser vegetation. Animals occurring on the Depot are typical of the northern desert shrub biome (Fautin 1946), and are adapted to sagebrush-grass, shadscale, and salt desert habitats.

The most common mammals are blacktailed jackrabbit, and ground squirrels. Predators are present in small numbers, including coyote, bobcat, badger, grey, red, and kit foxes, and spotted skunk. Mule deer occur occasionally, especially during winter on the juniper-covered areas of the North Post. Other mammals include desert cottontail, kangaroo rats, gophers, and various other small rodents.

Typical bird species which breed or reside in the area include red-tailed hawk and other raptors, ring-necked pheasant and chukar, both introduced gamebirds, sage grouse, mourning dove, black-billed magpie, common raven, and numerous species of waterfowl and other water birds which are restricted to the sewage lagoons (Inland Pacific Engineering Company 1982, Behle and Perry 1975, Walters 1982, Hall 1946, and Durrant 1952).

Two species of snakes and six lizard species occur. One species of amphibian, the western spadefoot toad, breeds in temporary pools.

Insect species and other invertebrates are listed by Chamberlin (1911) as eaten by the Gosiutes, including black cricket and several species of locust and cicada.

2.1.6 Paleoenvironment

Rankings place the Lake Bonneville Group formations in a range of fair to moderate importance paleontologically and the Oquirrh and Great Blue Limestone formations in a range of poor to moderate importance paleontologically for sensitive formations (Madsen 1980).

Paleontology. The current rankings for the Lake Bonneville Group are:

1. 31 in a field of 35 formations for invertebrate fossils.
2. 14 in a field of 15 formations for fossil plants.
3. The Provo formation of the Lake Bonneville Group ranks 15 and the Alpine Formation of the Lake Bonneville Group ranks 19 in a field of 50 formations for fossil vertebrates.

On the south and east sides of the study areas some formations have been ranked as paleontologically sensitive. The current rankings for the Oquirrh and Great Blue Limestone Formations are:

1. The Great Blue Limestone has been ranked 23 and the Oquirrh Formation has been ranked 25 out of a field of 35 formations for invertebrate fossils.
2. The Oquirrh Formation has been ranked 6 out of a field of 15 formations for trace fossil sensitivity.
3. The Great Blue Limestone has been ranked 50 out of a field of 50 formations for vertebrate fossils.

Prehistoric Environmental Changes. The natural environment of the intermountain area in the past 10,000 to 15,000 years underwent major changes especially near the Pleistocene-Holocene boundary with fewer pronounced changes and fluctuations in the Holocene. Environmental changes in the eastern Great basin (Bonneville Basin) during the late Pleistocene and Holocene have been reviewed recently by Curry and James (1982). A schedule of significant changes determined in this and previous studies is presented in Table 2-1.

The North Post and large parts of the South Post were covered by the waters of Pleistocene Lake Bonneville at its greatest depth (elevation 5175 ft., 1577 m) at about 14,200 Before Present (BP). After the catastrophic failure of the basin threshold and rapid regression to the Provo level (14,000 to 12,500 BP), much of the North Post was above the lake waters, and the water connection to Rush Valley was broken at Stockton Bar, an east-west thrust fault block. Rapid regression of Lake Bonneville early in the Holocene uncovered the remainder of the North Post. No information has been located on lake levels and ages in Rush Valley, but it is assumed the lake regressed rapidly in the early Holocene since no major rivers flow into the basin. The low area on the west side of the South Post may have remained flooded later. Presently, rare flooding periods are sufficient to prevent vegetation growth on the playa in the southwest part of the site (Hood et al. 1969).

The climate of the late Pleistocene has been described as various combinations of reduced temperatures and increased precipitation. Recent reviews by Van Devender and Spaulding (1979) suggest a climate similar to the present, with moderately cooler temperatures and greater precipitation. Mifflin and Wheat (1979) suggest an average precipitation increase of 68 percent in Nevada. This increase would have resulted in the presence of a conifer forest on the exposed parts of the North Post. Exposed parts of the South Post were probably sagebrush-grass or juniper woodland, typical of the unflooded parts of Great Basin valleys (Curry and James 1982).

Decreasing precipitation and/or changing temperatures caused rapid vegetation changes in the early Holocene, becoming essentially modern by 8500 BP (Curry and James 1982, Harper and Alder 1970, Bright 1966). The extinction of the Pleistocene megafauna, including muskox, horse, onager, mammoth, bison, camel, mountain goat, and other species occurred during the late Pleistocene and early Holocene (Grayson 1982). Vegetation and wildlife compositions have shifted in the last 8500 years (Table 2-1), as a result of climatic oscillations.

Table 2-1. A SUMMARY OF THE ENVIRONMENTAL HISTORY OF THE AREA OF TOOELE ARMY DEPOT

Date (a)	Curry & James 1982 Northeastern Great Basin Review & Summary of Available Literature	Date	Harper & Alder 1970 Hogup Cave Plants, Pollen, Vertebrates	Date	Bright 1966 Swan-Lake Pollen
2000 BP- Present	Essentially modern. More moist conditions at about 1500 and 600 BP.	500 BP- Present	More arid, currently as dry as any time in last 8500 years.	1700 BP - Present	Warm and dry. Modern conditions.
3500 BP- 2000 BP	Cooler, slight lowering of conifer forest and other vegetation zones. Rise of Great Salt Lake to higher than present around 3500 and 2800 BP.	1500 BP - 500 BP	Thickening of vegetation, increase of grass on uplands. Increase of large mammals.	3100 BP - 1700 BP	Cooler and moister, lower treelines, increase in trees and decrease in sagebrush.
5000 BP- 3500 BP	Near modern? Data somewhat ambiguous.			8400 BP - 3100 BP	Warm, semi-arid climate. Vegetation much like present.
7500 BP- 5000 BP	Warmer and/or drier than present (reduced moisture effectiveness) with two very dry periods (7000- 5500 BP and 6000-5500 BP). Great Salt Lake lower than present, possibly dry at peak except for marshes where streams enter.	3100 BP - 1500 BP 7800 BP - 3100 BP	More moist than present, sagebrush more abundant. As dry as present. Open water west of cave gone by end of period. Sage- brush declines.	12,000 BP - 8400 BP	Gradual shift from cool, moist climate to warm, dry climate. Conifer forest of lodgepole pine and limber pine replaced in lower elevations by sagebrush steppe about 10,300 BP. By end of period vegetation essentially modern.
12,500 BP- 7500 BP	Warming and drying, great decrease in glaciers and lacustrine systems, great rise in elevation of vegetation zones, with reversal of overall patterns from 11,000 to 10,00 BP. Extinction of Pleistocene megafauna.	8350 BP - 7800 BP	Already dry and desert- like, but more moist than later periods. Dominant species sagebrush and shadscale.		

Table 2-1. A SUMMARY OF THE ENVIRONMENTAL HISTORY OF THE AREA OF TOOELE ARMY DEPOT (Continued)

Date (a)	Curry & James 1982 Northeastern Great Basin Review & Summary of Available Literature	Date	Harper & Alder 1970 Hogup Cave Plants, Pollen, Vertebrates	Date	Bright 1966 Swan-Lake Pollen
15,000 BP- 12,500 BP	Final resurgence of glaciers and lakes, valley floors not under water mostly dominated by sagebrush and to a lesser extent juniper.				
17,000 BP- 15,000 BP	Warming and drying, some retreat of glaciers and lakes.				
23,000 BP- 17,000 BP	Full advance of glaciers and lacustral systems.				

(a) Before Present (BP)

Historic Environmental Changes. Since Euro-American settlement, changes in the surrounding area have included diversion of perennial streams for irrigation, severe overgrazing, cultivation of land for both irrigated and dry land farming, changed fire regimes, local extermination or reduction of wildlife populations, and construction of towns, roads, and industrial, military, and other facilities.

Environmental changes in Tooele and Rush Valleys resulting from grazing and related factors are described by several authors. When first settled around 1850, Tooele Valley was described as a grassland and excellent pasturage (Anonymous 1978, Cottam 1961). These grasslands undoubtedly occupied areas of deeper, less saline soils, while poorly drained, saline soils were likely in salt desert shrub, much as today. Moist areas near streams and springs probably supported lush meadows.

By 1900, severe depletion of large parts of the western ranges were apparent (Young et al. 1981). Peak use occurred in Tooele Valley from 1905 to 1910, when 225,000 sheep crossed the valley spring and fall. Vegetation deterioration occurred in several stages. Initially, overgrazed grasslands were invaded by sagebrush, but as it increased, it was burned off by sheepmen to encourage grass growth, thus further depleting the range. Junipers were largely eliminated by burning, heavy browsing by sheep, and by cutting for firewood. Similar depletion of juniper woodland occurred in Salt Lake and Utah Valleys (Christiansen and Brotherson 1979). As the range deteriorated, cheatgrass invaded and became dominant, but was replaced under further heavy use by Russian thistle.

In the early 1900's, areas were ploughed for dry land farming, and by the early 1930s large areas were practically devoid of vegetation. Large-scale wind erosion was occurring, and the area became known as the "Grantsville Dust Bowl." Much of North Post was in the most critically affected area. Subsequent revegetation by the Grantsville Soil Conservation district has reclaimed the land, but up to 15 in. (38 cm) of topsoil was lost to wind erosion. At the same time, some 50,000 acres (20,235 hectares) in Rush Valley also were experiencing severe wind erosion, probably including much of the South Post based on a map of areas susceptible to wind erosion in Wilson et al. (1975). Areas grazed less severely have experienced changes in species composition and productivity, including a decrease of perennial grasses and palatable shrubs like black sagebrush and winter fat, an increase of big sagebrush and shadscale, and invasion of alien weeds (Tisdale and Hironaka 1981, Stewart et al. 1940, Pickford 1932).

Several species of large mammals have been eliminated or severely reduced in the region during historic times, including wolf, grizzly bear, pronghorn, elk, bison, and bighorn sheep. However, only pronghorn were likely residents in the immediate site area.

Environmental changes in more recent years have resulted from construction and operation of the military facility. This has caused a loss of vegetation and wildlife habitat.

2.2 THE CULTURAL ENVIRONMENT

2.2.1 Prehistory

Four stages encompass the prehistory of the Tooele study area. These

include the Lithic or Paleo-Indian, Archaic, Formative, and Post-Formative stages. In this study, stage is defined as a level of cultural development.

Lithic or Paleo-Indian Stage. The earliest definable stage to appear in the Great Basin was the Lithic or Paleo-Indian Stage. Willey and Phillip (1958) offered the following description of the Lithic or synonymous Paleo-Indian Stage:

This stage was conceived of as embracing two major categories of stone technology: (1) Unspecialized and largely unformulated core and flake industries, with percussion the dominant and perhaps only technique employed, and (2) industries exhibiting more advanced "blade" techniques of stone working, with specialized fluted and unfluted lanceolate points the most characteristic artifact types.

The archeology of this stage attempts to answer questions concerning the antiquity of human settlement in the New World and the nature of the adaptations made by those immigrants in a pristine Post-Glacial environment.

Jennings (1978) identified two different sets of traditions within the Lithic stage within the Great Basin, the Paleo-Indian Tradition and the Chopper-Scraper Tradition. Tradition refers to a persistence through time of a life style, artifact style or some definable entity. The first is the well known and documented Paleo-Indian tradition consisting of the Llano, Folsom, and Plano complexes (Jennings 1978:17). These were associated with large, now extinct fauna in the cases of the Llano and Folsom, however, the Plano depended on large modern fauna as described below. The second tradition, the Chopper-Scraper or pre-projectile point, is not so well defined as the Paleo-Indian tradition and is described below.

Paleo-Indian Tradition. The Paleo-Indian tradition is comprised of the Llano, Folsom, and Plano complexes. These complexes have both diagnostic and stylistic criteria, such as point types, and chronological implications, since they occur in succession and are well dated. The term complex refers to the variety of tools and other materials that comprise the entity under consideration. The term period refers to the time frame occupied by the complex. Consequently, Clovis Complex can be used to differentiate among other archeological entities, and Clovis Period can be used to place it in time. The terms Llano and Clovis often are used interchangeably, since the diagnostic spear point of the Llano complex is the fluted Clovis point.

Pre-Clovis Period. A number of sites and localities have been excavated dated prior to the Clovis Period. These sites and localities are being subsumed under the general heading of the Pre-Clovis Period. The term Pre-Clovis as a unique period was first used by Humphrey and Stanford (1979) in a publication of the Anthropological Society of Washington. Despite the comparatively large number of Pre-Clovis sites located and excavated over the years, none have won universal acceptance for their antiquity. The controversy centers on either the nature of the archeological evidence, the geological context, or the efficacy of the dating methods used. However, some of these sites are probably genuine.

One site near the study area has been attributed to the Pre-Clovis period. It consisted of two small caves and a surface lithic site located on a high Bonneville terrace south of Salt Lake City. The terrace, once felt to be 40,000 years old, now is estimated to be 18,000 years old. There is no substantiating evidence to prove the surface finds are equal in age to the supporting geological structure (Clark 1975 a and b).

Clovis Complex (Llano Complex). The Clovis complex is the earliest human culture accepted by North American archeologists. Sites attributed to the Clovis complex are dated to approximately 11,000 BP (9200 BC). Clovis hunters specialized in mammoth hunting; Clovis kill sites are known from Arizona, Colorado, Idaho, New Mexico, Oklahoma, and Wyoming. In Utah, an isolated Clovis fluted point has been reported from the Acord Lake region (Tripp 1966) and similar finds occur throughout the Great Basin (Aikins 1978: 147, Fig. 42).

Folsom Complex. The Folsom Complex followed Clovis. Folsom hunters specialized in taking the now extinct longhorned bison, *Bison antiquus*. As many as a dozen of these huge creatures were killed at one time during a typical hunt. Folsom materials have been found throughout Utah at Silverhorn (Gunnerson 1962), Cederview (Lindsey 1976), Moab (Hunt and Tanner 1960), Green River (Tripp 1967), and Sweet Alice Springs, Utah (Sharrock and Keane 1962). During the preliminary research on this project, a Folsom fluted point was found in the Smithsonian collections that Lt. Karl Schmitt discovered in "vicinity of Dugway Proving Ground in Dugway Valley 15 miles (24 km) south of Skull Valley Indian Reservation, Tooele County, Utah, ca. one mile (1.6 km) west of village" (Catalogue #386226).

Plano Complex. The Plano complex may be subdivided into a number of sub-complexes, each with its own diagnostic characteristics. Plano peoples as a whole specialized in the hunting of large animals, particularly the extinct bison, *Bison occidentalis*. The fact that they were able to kill large numbers of these animals, as many as 200 in a single kill, indicates that Plano population density had reached a fairly high level. Specialized butchering areas, i.e. front quarters, hind quarters, etc., found at these mass kill sites are indicative of a high degree of specialization and social complexity.

Plano complex materials are found occasionally in the Great Basin, but as James (1980:6) points out, "...although fluted (Clovis and Folsom materials described earlier) and other lanceolate points are present in the Great Basin, evidences of cultural remains in association with extinct fauna is generally lacking."

Chopper-Scraper Tradition. In marked contrast to the well defined and widely accepted Paleo-Indian tradition, the Chopper-Scraper or "pre-projectile point" tradition is poorly defined and not widely accepted. The "choppers" tend to be edge-chipped pebbles or nodules and the "scrapers" usually are bifacially worked nodules or pebbles that Jennings (1978:17) finds reminiscent of the bifacially worked hand axes of the European Paleolithic period. Because materials attributed to the Chopper-Scraper tradition tend to be found on old land forms such as beaches or terraces near ancient lakes, and along streams, arguments for their considerable age have been advanced. On the other hand, the fact that most specimens are surface finds, mitigates against chronological control and therefore acceptable antiquity. The Chopper-Scraper tradition is a controversial problem that has yet to be resolved.

San Dieguito and the Western Pluvial Lakes Tradition. Following the Clovis time period are a series of complexes characterized by large shouldered and stemmed lanceolate projectile points, leaf-shaped knives, crescents, flake scrapers and domed scraper-planes (Aikins 1978:147). In southern California this material is best known from the Harris site in San Diego, the type site of the San Dieguito complex. In 1967, Warren defined the San Dieguito complex as a "generalized hunting tradition" dating to 10,000 BP (8000 BC) (7900 and 6500 BC at the Harris site). In 1968, Irwin-Williams noted that San Dieguito materials "...commonly occur near playa edges, and may have been deposited during a period of relatively greater effective moisture."

Similarly at the Fort Rock Caves, Fort Rock Valley, Oregon, Bedwell (1970, 1973) recovered lanceolate projectile points which resembled those assigned to the San Dieguito complex, and date between 11,000 and 8000 BP (9000 - 6000 BC). Associated with these points were knives, scrapers, mano and metate fragments, basketry, and sagebrush bark sandals. Stone crescents also were common to the northern Great Basin at this time.

Bedwell (1973) saw a great deal of similarity in artifact assemblages found on sites adjacent to pluvial lakes such as those in the Fort Rock Valley. He proposed these assemblages be grouped together under what he termed the Western Pluvial Lakes tradition. This tradition was directed toward the exploitation of lacustrine and marsh environments and lasted until ca. 8000 BP (6000 BC) at which time pluvial lakes began to disappear.

The Archaic Stage. The Archaic Stage is viewed as an adaptive response to the warming trend that occurred at the end of the Pleistocene period, the main effect being replacement of Pleistocene megafauna with modern faunal types. With the loss of megafauna and the shift to modern environmental conditions, greater dependence was placed on smaller and more varied faunal species. Because of this shift to a more varied economy or subsistence base, Archaic lifeways are often described as employing a broad spectrum exploitation strategy. Willey and Phillips (1958:107) defined the Archaic stage as "... the stage of migratory hunting and gathering cultures continuing into environmental conditions approximately those of the present."

Archaic societies intensively exploited their local environments. These groups depended heavily on plant resources and seeds. Shellfish were collected where available and fishing was important. No species of mammal was overlooked. As the ecological niches were systematically exploited for their resources and as the food base was broadened, there was an increase in tool diversity and specialization.

Archaic communities were comprised of small groups of related people living a semi-sedentary lifestyle. Termed "restricted wandering" (Beardsley 1956), this lifestyle was based on seasonal movement from one exploitable resource to another. This type of mobility tended to limit group size as well as inhibiting the kinds of cultural development associated with a sedentary lifestyle. Since a wandering lifestyle limits the quantity of cultural items that can reasonably be acquired or transported, the storage of tools on site and returning to the same sites or locales each year may have been practiced.

Based on his work at Danger Cave, Jennings (1957) proposed the concept of the Desert Culture as the local interpretation of the Archaic Stage. This culture was characterized by a specialized artifact inventory, specifically

adapted to survival in the arid and semi-arid conditions of the Desert West. Milling stones indicative of plant and seed preparation are major characteristics of the Desert Culture as is a wide variety of implements made from wood, bark, and fiber, including baskets, netting, mats, and sandals.

Jennings' (1957) concept of a single Desert Culture has received much criticism in recent years. Other researchers have countered that the Desert Culture concept stressed only the desert way of life and failed to recognize the importance of other environmental niches, particularly the lacustrine environment of the Great Basin (Baumhoff and Hiezer 1965, Butler 1978, Heizer and Krieger 1956, Heizer and Harper 1970, and Warren and Ranere 1968).

Over the years, Jennings (1974) has modified his Desert Culture concept, bringing it more in line with these trends. It is now accepted that the prehistoric occupants of the Great Basin exploited a wide variety of plants and animals found in differing environmental settings on a seasonal basis. Consequently, artifact inventories found in differing environmental settings tend to represent specific adaptations to specific local conditions.

Use of multiple environments on a seasonal basis requires a high degree of mobility in order to exploit ephemeral food resources. This pattern of activity was first outlined by Julian Steward (1970) in his descriptions of the seasonal patterns of the current Native American occupants of the Great Basin. Archeologically, Steward's model of exploitation has been tested in the Reese Valley of Nevada by Thomas (1972, 1973), and by Grady (1980) in the Piceance Basin of northwestern Colorado. In the Reese Valley, Thomas clearly demonstrated a pattern of riverine zone exploitation coupled with use of the distant, but complementary, pinyon-juniper zone. Grady's work also outlined a pattern of seasonal resource exploitation in which the resources were distributed by marked altitudinal differences, and the major integrating factor between the uplands and lowlands was the annual movement of the Basin's mule deer herd. Both patterns were typical of the Desert Archaic Culture.

Madsen (1982:213-216) has divided and characterized the Archaic period of the Great Basin into the following three sub-periods: Early Archaic, Middle Archaic, and Late Archaic.

Early Archaic (8500-5500 BP) (6500-3500 BC)

Occupation - restricted to lake edge sites - no evidence of upland sites at this point in time (tentative conclusion).

Preferred location - cave/rock shelters overlooking lake adjacent to freshwater springs. Open dune areas near lakes also utilized.

Diagnostics - Elko, Pinto and Humbolt series point types, Basketry and flat willow staves present.

Demographics - Population increasing (numbers of people and numbers of groups increasing).

Subsistence - Almost exclusively related to lake edge resources.

Middle Archaic (5500-3500 BP) (3500-1500 BC)

Occupation - Upland areas begin to be occupied as result of population increase and diminishing lake resources. Greater movement, shifting from resource to resource.

Diagnostics - Gypsum points plus movement of Elko, Pinto and Humbolt point styles into the central and western areas of the Great Basin.

Subsistence - Mountain sheep preferred, deer and rabbit common.

Late Archaic (3500-2000 BP) (1500-0 BC)

Occupation - Lake edge marshes, halophytic-dominated saltflats and fresh water springs flooded due to rising lake levels. Abandonment of lake edge sites, and shift to upland areas.

Diagnostics - Rose Spring projectile points, indicating introduction of the bow and arrow.

Demographics - Population decline of unknown magnitude.

Subsistence - Possible use of Pinyon nuts for first time.

One of the major problems facing archeologists in Utah deals with the nature of the Archaic Stage-Formative stage interface. Aikens (1970) and Jennings (1957, 1974) argue that the adaptive strategies of the archaic period remain consistent over a period of 10,000 years in spite of changing environmental conditions and that the Archaic stage developed into the agriculturally oriented Formative stage. Madsen and Berry (1975:391-405) have reexamined the evidence from Hogup Cave (Aikens 1970) and developed and refined hypotheses raised first by Steward (1937) that argue for an hiatus between the Archaic and the Formative. This hiatus has been attributed to changes in climate conditions since flooding forced the abandonment of the lake edge and marsh environments, thus providing a gap in occupation between the archaic occupation of the area and the succeeding Formative occupation. While the issue has yet to be resolved (cf. Aikens 1976:543-545 for a counter argument) the evidence for an hiatus at present seems to be overwhelming, at least in the Salt Lake Area.

The Formative Stage. Whether or not there was an interruption in cultural development, the Archaic Stage did give way to the Formative. Willey and Phillips (1958) defined this stage to include, "the presence of agriculture or any other subsistence economy of comparable effectiveness and by the successful integration of such an economy into well established sedentary village life." The latter definition is particularly appropriate for Utah.

The Fremont Culture is the cultural entity equated with the Formative Stage in Utah. This culture was characterized by the cultivation of maize, a sedentary or semi-sedentary lifestyle, the presence of pithouses and masonry dwellings, a distinctive rock art style, and the presence of ceramic graywares. Despite the homogeneity implied by the above definition, the Fremont should be treated as a theme with many variations. John Marwitt (1970) published his seminal work on Median Village in which he developed a detailed overview of Fremont regional variations. Although criticized, it remains the commonly accepted scheme (cf. Madsen 1980).

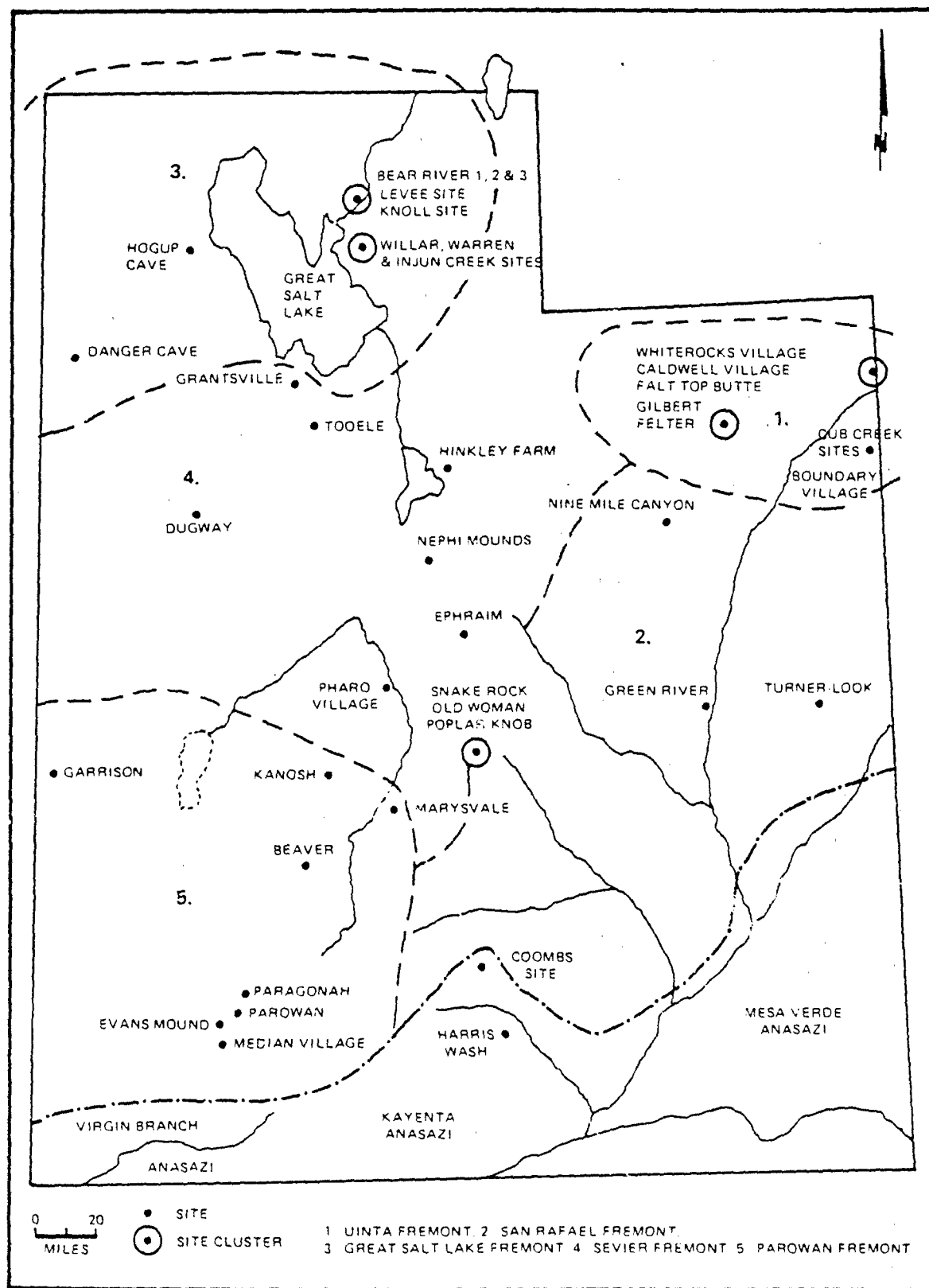
Marwitt (1970) discussed five regional variants, but only the Sevier variant has any significance in the Tooele study area (see Figure 2-1). Marwitt's Sevier variant is quoted as follows:

Sevier Fremont

Dating - AD 780(?) to 1260.

Named For - The Sevier River of central Utah.

Excavated Sites - Grantsville (Steward 1933b), Tooele and Ephraim (Gilllin 1941), Hinckley Farm (Green 1961), Nephi Mounds (Sharrock and Marwitt 1967), Pharo Village (Marwitt 1968), Old Woman and Poplar Knob (Taylor 1957), and Snake Rock (Aikens 1967).



(MARWITT 1970:137)

Figure 2-1. FREMONT REGIONAL VARIATION

Diagnostic Attributes:

Domestic Architecture - Quadrilateral and circular pit dwellings often with ventilators or crawlway entrances, but without deflectors (except at Snake Rock, where the deflectors are stone slabs); pit dwellings constructed within a larger primary pit.

Ceramics - Sevier Gray is the dominant plain grayware type, but Snake Valley Gray is present in proportions as high as 15 to 20 percent; Great Salt Lake Gray (at Hinckley Farm, Tooele, and Grantsville) and Turner Gray, Emery Variety (at Snake Rock, Old Woman, and Poplar Knob) also occur. Ivie Creek Black-on-white is the only indigenous painted ware, with a distribution in the southern and eastern portions of the area; Snake Valley Black-on-gray is fairly common, but is probably intrusive from Parowan Fremont. Surface manipulation of grayware (except corrugation and except on Snake Valley Gray) is common. Designs painted on grayware with fugitive-red pigment are rare but may be diagnostic.

Flaked Stone - Slim triangular unstemmed points, broad triangular basal-notched points, and medium to large side-notched points predominate. Other diagnostics are large leaf-shaped blades, drills made from reworked side-notched points, and large "turtle back" scrapers.

Ground Stone - No diagnostic artifacts, but a heterogeneity of ground stone artifacts is characteristic of Sevier Fremont. Manos and metates exhibit great variety; "Utah type" metates are particularly well made.

Miscellaneous - Bone, antler, and unfired clay artifacts are not diagnostic.

Sevier Fremont sites tend to be small villages situated on alluvial fans near canyon mouths and their dependable water sources. The villages consist of a few pit houses and associated coarse adobe dwellings. In terms of material cultures, the Sevier is fairly conservative. However, the frequency of painted pottery increases through time and pit houses tend to be dug deeper with more vertical sides through time. The Sevier Fremont is the least consistent, typologically, of all of Marwitt's variants (Marwitt 1970:141).

The Post-Formative Stage. The Post-Formative Stage which followed the Fremont in Utah is characterized by the appearance and spread of Numic speaking peoples throughout the region. The term Numic refers to a branch of the Uto-Aztec linguistic family. Ethnographically, this branch includes the various Shoshone groups such as the Western Shoshone, Ute, and Southern Paiute. These people occupied the area from ca. AD 1200 until their displacement by Anglos in the middle of the nineteenth century.

The Numic speakers' homeland originally was in the southwest portion of the Great Basin. Starting ca. 1000 AD, they spread northward and eastward into Utah and on the Colorado Plateau (Lamb 1958, Miller 1966, Fowler 1972,

and Wright 1978). According to Madsen and Berry (1975), they were contemporaries with the preceding Fremont peoples and through resource competition, may have contributed to the Fremont demise. Stuart (1981) feels that early Numic occupation was restricted to lake edges and was followed by a shift to the adjacent upland areas.

Based on the ethnographic record, particularly reports of Steward (1970), the Numic speakers of the area followed an annual round of economic activities as they shifted from the exploitation of a given resource to another resource on a seasonal basis. During the course of the annual round, group size varied from nuclear families (a self-supporting economic unit) to large groups. There was also a concomitant shift in tool inventories and political structures. The technology, social organization, and ideology of the pertinent Numic speaking groups in the study area are contained in Section 2.2.2 of this report.

Despite the richness of the ethnographic record, little is known about Numic archeology. We are still in that strange position described by Steward (1937:121) and quoted by James (1980:48): "The writer has examined many caves known to have been used by Shoshoni but he failed to find any identifiable Shoshoni (sic) objects. The scarcity of objects at most Shoshoni sites is striking."

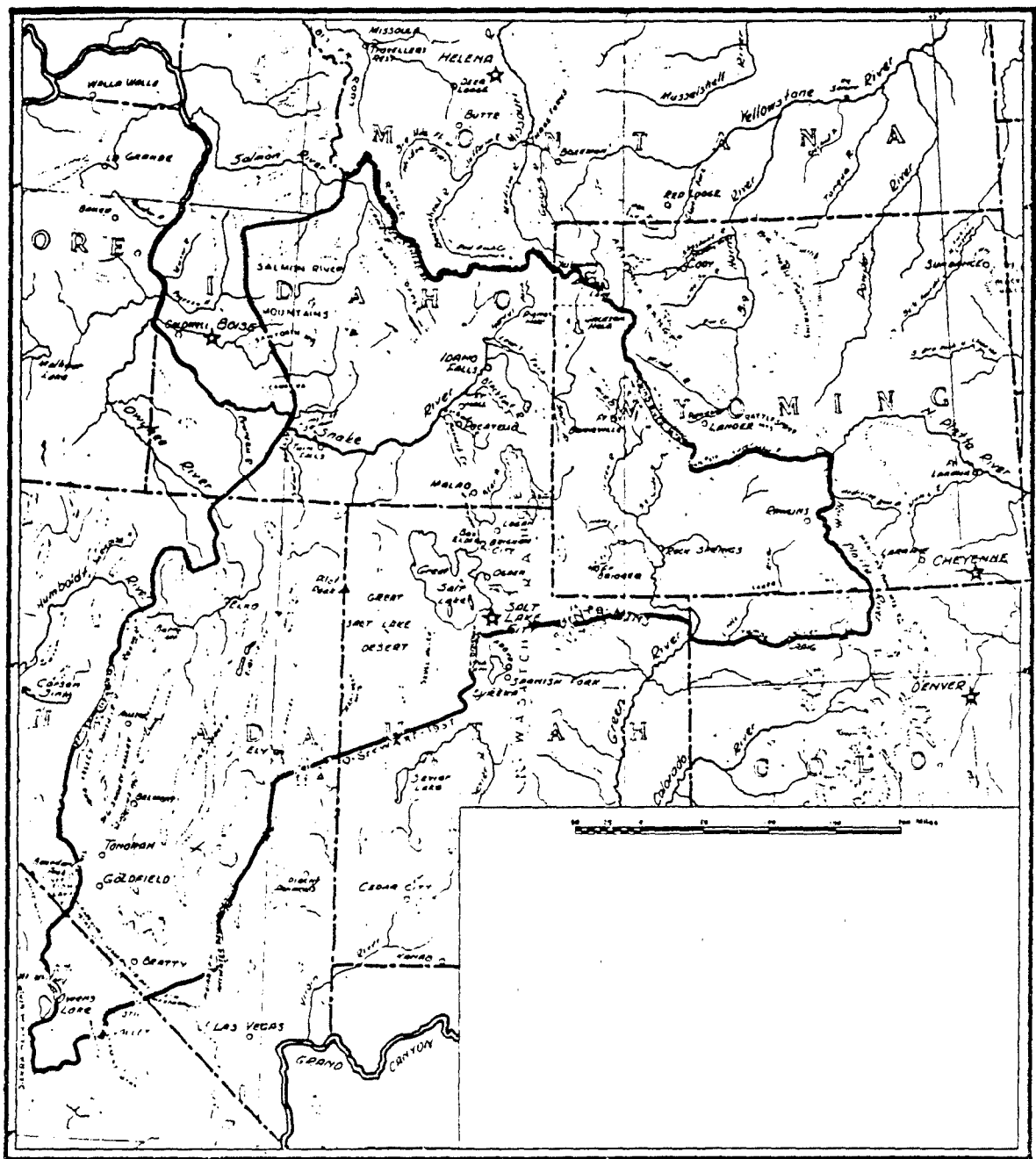
2.2.2 Gosiute and Western Shoshoni Ethnography

This overview provides a study of lifeways of the Western Shoshoni with primary emphasis on the Gosiute. The Western Shoshoni aboriginal territory encompassed the area of present day Tooele Army Depot Railroad Maintenance Facility (AD-RR), while the Gosiute encompassed the area of present day Tooele Army Depot. Both Western Shoshoni and Gosiute lifeways and material culture were similar.

In aboriginal and early white contact periods, the Gosiute occupied the most arid and desolate area of the Great Basin. The aboriginal Gosiute population was concentrated in small camps in a crescent around the Great Salt Lake Desert yet, they rarely wandered onto the Salt Desert. The largest population was centered in Deep Creek Valley. Others resided in Rush, Skull, and Tooele Valleys, the eastern most extent of their aboriginal territory. Aboriginal territory of the Gosiute and Western Shoshoni is shown on Figure 2-2. The treaty of 1863 defined the territory of the Gosiute as follows:

Article 5: It is understood that the boundaries of the country claimed and occupied by the Goship (sic) tribe, as defined and described by said bands are as follows: On the north by the middle of the Great Desert; on the west by Steptoe Valley; on the south by Tooele or Green Mountains; and on the east by Great Salt Lake, Tuilla and Rush Valleys (Reagan 1934a:47).

Reliance on ethnographic models in understanding and interpreting archeological remains and aboriginal lifeways is fundamental in studies of Great Basin prehistory. Julian Steward's cultural-ecological model, based on his Great Basin research, depicts small groups living in a food poor



(STEWART 1966:215)

Figure 2-2. BOUNDARY OF WESTERN SHOSHONI AND GOSIUTE INDIAN TERRITORY

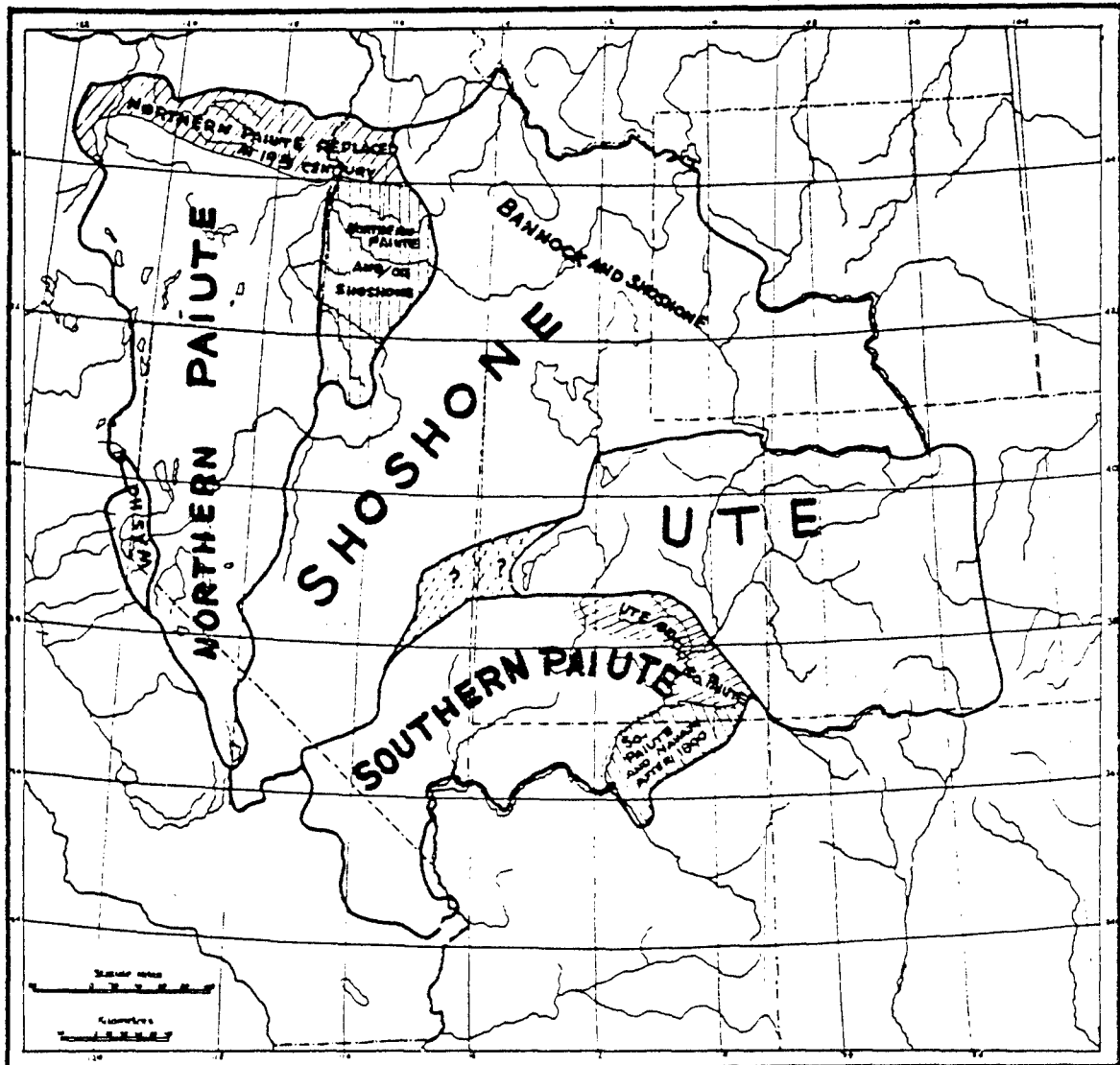
environment, dispersed for much of the year in a patterned-seasonal round of activities, and assembling into larger, non-political groups in times of food abundance. The Steward model can be applied to both the Gosiute and Western Shoshoni (Steward 1970:1). Material culture, settlement, and subsistence patterns, lifeways and non-Indian influence will be examined from historical accounts as it may pertain to the archeology of the study area, potential sites, and the management plan for the installation.

The Great Salt Desert was the least favorable area of habitation of the Great Basin. The higher sections adjoining the Desert are more conducive to the survival of flora and fauna, and it was in these areas the Gosiute acquired most of their resources. Due to the extreme aridity of the area, it is estimated by Steward (1970:134) that the population could not have been more than 1 person to 30 to 40 square miles (7770 to 10,300 hectares) prior to European contact. Many early accounts of trappers and explorers described the Gosiute as impoverished and starving, living on snakes and lizards and digging for roots in a state barely above an animal. Due to these accounts these people became known as the "Digger Indians."

Linguistic Family. All Great Basin groups spoke languages belonging to the Shoshonean branch of the major Uto-Aztecan linguistic family. The term Numic is used to refer specifically to the Basin Shoshonean groups (Spencer and Jennings 1977:180). The Uto-Aztecan language family includes not only the culturally impoverished Gosiute but the empire-building Aztecs of Mexico. Linguistically the Shoshonean speaking Hopi of Arizona are related to the Numic, as are the Pima and Papago in Arizona and other groups in California. Glottochronologists put the separation of the Aztec and Numic speakers about 4000 to 5000 years ago. The Numic language is further separated into three divisions, Western, Central, and Southern (Figure 2-3). Fowler and Fowler (1971a:97) include the Gosiute in the Central Numic linguistic division with the Comanche, Weber Ute, Ruby Valley, and White River Shoshoni.

Subsistence. Human ecology in the Great Basin requires consideration of natural features, environment, and the culture devices with which the environment is exploited. Important features of the natural environment were topography, climate, seasonal distribution of plants and animals, and, especially, the occurrence of water. Cultural behavior patterns were based on consideration of these factors as well as population density and distribution, division of labor, and the methods of food procurement, territory exploited, and time required for economic pursuits, as well as village size, distribution, and permanency.

Economic pursuits were divided on the basis of sex. The nuclear family was a self-supporting economic unit, consisting of mother, father, and siblings. The native flora and fauna supplied material for household goods, weapons, dwellings, and food. Women gathered nuts and seeds. Men hunted large game, manufactured chipped stone tools, wove rabbit fur blankets, and constructed houses. The Gosiute existed on a bare subsistence level and there was no excess time in their economic pursuits to produce surplus materials for trade or to support specialization such as political or religious organization and hierarchies.



(STEWART 1966: 207)

Figure 2-3. LINGUISTIC BOUNDARIES

Plants, roots, berries, nuts, seeds, and greens were more important in the diet of the Gosiute than animal foods. Gathering activities can be divided into four seasonal rounds (Steward 1970:20). In the spring they left their winter villages often to a distance of 30 to 40 miles (48 to 64 km) to gather sprouts and greens along streams. In the summer, edible roots were dug and berries gathered. Early in the fall pine nuts ripened. Pine nuts, an important source of energy, were gathered by women. If pine nut crops were in abundance, families were able to remain together during the winter. In the Deep Creek Mountains, on the Nevada-Utah border south of the Great Salt Lake, semi-permanent villages were constructed near pine nut groves so nuts could be cached or carried a short distance to the villages. There was no claim of ownership for the pine nut groves. Families shared on a use and need basis. Favorite picking areas were around Vernon, south of Tooele Valley in the Stansbury Mountains, Deep Creek, and the Kern Mountains, southwest of the desert. Because of the occasional nature of pine nut crops, it probably was only one in a series of important seed-food plants that was harvested and stored in subterranean caches for winter use. A total dependency on pine nuts or any one crop would have a disastrous effect on these people. They exercised minimal control over their food supplies, but Steward (1970:138) states that wild seeds were sowed in the spring after sage brush had been burned off, and the seed crop was harvested in the fall. This practice, however, should not be construed as agriculture or the cultivation of domesticated plants.

Almost every animal including various insects were utilized for food. They subsisted on insects, rodents, lizards, snakes, fish, and rabbits. Rabbits, relatively abundant in the Great Basin, were the most important animal food in the Gosiute diet. Men, women, and children participated in the communal rabbit drives under the direction of a Shaman, a leader with culturally defined supernatural/religious powers. Rabbits were driven into nets placed in a semi-circle many hundreds of yards in diameter, where they were clubbed. Drives were conducted in the fall and winter, when the fur and meat was at prime. Gophers, an abundant source of food, were trapped or flooded out of their holes.

Communal antelope drives were held infrequently, and only when animal populations increased to warrant the effort. The drives were among the few economic activities not restricted to family groups. Antelope, due to their speed, were not easily taken by lone hunters. Large groups of men on foot surrounded and drove antelopes into corrals. All Gosiute antelope drives were conducted by a Shaman who was said to have received special supernatural power that would capture the animals' souls, rendering them docile and stupid (Steward 1970:34). Other large game was present, but were not numerous enough to be the main portion of their diets. Deer, mountain sheep, bears, and elk were hunted in the mountains. Coyotes, abundant in the area, figured prominently in folklore, and, therefore, were not killed.

Several different methods were employed to hunt large animals. Ambushes were prepared along animal trails by digging a pit and hiding behind a wall of brush until the game passed. Steward (1970:138) and Malouf (1951:15) state deer surrounds were led by an expert hunter. Deer also were stalked and driven over cliffs in the mountains. Fire brands were used to drive animals into an enclosure. Poison used on arrows caused the animals to weaken but did not kill them.

Mormon crickets (a grasshopper-like insect) and grasshoppers were another important dietary staple. Trenches, 30 to 40 ft. long (9 to 12 m) and 1 ft. deep (0.3 m), were dug and lined with grass. Everyone participated driving the crickets into the flaming grass. The parched insects were ground on metates and the paste stored. Insect wings and legs have been identified in coprolites from Danger Cave, indicating utilization of insects for centuries to satisfy human protein needs.

In an arid environment like the central Great Basin, water is a critical and scarce resource. To those with an intense knowledge of their environment, supplies of water were available in addition to the springs and streams. The ability to identify those water sources was important to the survival of central desert peoples. Egan (1963:52) described the Gosiute locating water at the base of sand dunes and in cracks and caves in limestone formations. He stated, "A person might ride or walk within six feet (1.8 m) of it (water) and still think it was miles (km), and hot ones, to the nearest water." Camps in dune fields and desert locals were not as waterless as reported.

Material Culture. Gosiute material culture has been described as simple and reflective of their economic poverty. Function was the primary ingredient of their material items. Having to move from place to place on foot helps explain the scarcity of material items. Belongings were carried great distances in a pack strap which was passed from the forehead to the back (Malouf 1951:41). Pressure on the head was relieved with cedar bark.

Malouf (1951:31) states they inhabited caves, rock shelters, constructed brush and conical structures of juniper poles thatched with bark and branches. These structures appear to have been the more permanent winter dwellings used in the foothills and mountains. A fire pit was sometimes located in the center with a smokehole at the top. Devices for making and preserving fire were important items in Shoshoni material culture. A drill and wooden platform with two to four holes bored in it, covered with dry cedar or sage brush or tinder, was used. The apparatus, wrapped in skin, was stored in a basket or bag. Bow drills were not used (Malouf 1951:69).

Household goods consisted of mano and metates used for grinding seeds, insects, meat, berries, and pine nuts. Spoons were made of antler or wood. Dippers were rare, but were made like basketry dipped in pitch, or of sheep horn (Malouf 1951:35). Basketry was a well developed art. Squawbush and willow were used for manufacturing both twined and coiled baskets. Price (1952:24) lists various types of baskets used by the Gosiute including conical carrying baskets, winnowing baskets, water baskets pitched on interior and exterior, and seed baskets. Cradle boards, cedar bark skirts, cedar bark aprons, fishing baskets, rabbit nets, and mats were other woven items.

Pottery has been described for the Gosiute by Malouf (1951:40), Defa (1979:16), and Price (1952:35). Fragments of buff colored, coarse silica tempered pottery have been found in the Deep Creek region. Malouf (1951:40) states pottery was rapidly replaced by Euro-American utensils.

Rabbit skin robes and capes, woven from continuous strips of rabbit fur, were worn by everyone. Two piece moccasins were worn occasionally, although usually they went barefoot. Men cut their hair short in front above the eyes, women wore theirs cut randomly with the cuttings used for

making nets. Bodies occasionally were painted to reduce sun glare, for supernatural protection, and as protection from insects. Both boys' and girls' ears were pierced (Malouf 1951:48).

Nets, snares, and traps were used in hunting sage grouse, water fowl and jack rabbit. Rabbit nets were made from vegetal fiber twisted into cordage and woven into nets from 150 to 200 yards (137 to 183 m) long and 30 in. (0.8 m) high with a mesh of 2 in. (5 cm) or smaller. They were family-owned and manufactured by men. Nets have been identified archeologically at Hogup and other caves in Utah (Aiken 1970:125).

Lithic tools included side-notched projectile points and other multi-functional chipped tools such as scrapers, drills, knives, and burins (Malouf 1951:46). Three kinds of bows were made, the self bow, sinew backed wood, and sinew backed horn. Sheep horn bows were known to have been used by the Deep Creek Gosiute. Arrows were tipped with stone, bone, or wood according to function. A two-prong unfeathered arrow was used for hunting fish. All other arrows were feathered. Malouf (1951:44) and Steward (1970:134) describe arrows being poisoned for hunting game. The poison was made from the decayed blood of deer, rattlesnake poison, or certain herbs. Arrows were carried in a quiver made from the whole skin of either fox, wildcat, or fawn.

Socio-Political Organization. Socio-political organization among the Gosiute and Western Shoshoni was conditioned and limited by their environmental setting. Hunting and gathering devices were simple. Lack of transportation limited population density and dictated a bare subsistence living, which largely determined the size, nature, and permanency of the population. Among the Western Shoshoni and Gosiute, it was economically impossible for families to remain in one place for any length of time. Due to these limiting factors, the most important socio-political unit was the nuclear family and the small winter villages, whose size depended largely on pine nut crop.

The kinship system was simple. Descent was determined in both paternal and maternal lines. There is some evidence according to Steward (1970:135) of several somewhat distinctive local subdivisions whose members associated more frequently. These local subdivisions were not based on a sense of band solidarity. These local groups, where there was an adequate food and water supply, found it more convenient to associate with their immediate neighbors for antelope drives, dance, and other communal activities. The Gosiutes had no hereditary chiefs, the society was highly individualistic. Little authority was recognized beyond the head of the family except for the Shaman's leadership in communal hunts and curing illnesses.

Rights of Passage. Shoshoni life was centered around the nuclear family. Events such as birth, puberty, and death were surrounded by extensive beliefs. The belief system, rather than being ideological, was practical dealing with health and economic security.

Certain food taboos existed during pregnancy for both the man and woman. A special structure was built at the time of delivery and for confinement after birth. Both man and woman were bathed after the birth and both observed food restrictions. The child was bathed immediately after

birth and placed in a cradle board. Malouf (1951:61) noted that twins were thought to be a sign of adultery and if one died, the other may have been killed.

Puberty rites for girls at the first menses included isolation in a special enclosure and instructions on proper female behavior were given by female family members. Girls were required to eat a restrictive diet (Malouf 1951:62). Although no specific puberty ceremonies were held for boys, there were special rites for the first kill, including special bathing rites, painting the body red, and distributing the kill to family members.

Marriage rules were simple with cross cousin (a sibling of the mother's brother or the father's sister) or pseudo cross cousin marriages preferred. Marriages were informal. Men who wanted wives often abducted either married or unmarried women. Both polyandry and polygyny occurred and polygyny usually was sororal. Divorce was as simple as marriage.

According to Malouf (1951:64), the treatment of the corpse after death varied at different localities. Families gathered near the home of the dead for the burial ceremony. Some removed and buried the corpse, abandoning the shelter. Others set the death shelter afire with the body inside. Property was destroyed or distributed among relatives. Valuable property including rabbit nets and bows and arrows, was not destroyed. Mourning practices were individualistic and sometime people cut their hair to demonstrate grieving (James 1980:204). Both sexes of a spouse or partner were allowed remarriage within a month of the death.

Religious Beliefs and Social Events. Religious and spiritual concerns were interrelated with subsistence activities. However, gathering activities and acquisition of small game, the most important economic pursuits, had no special religious treatment. The rabbit and antelope drives and hunting of elk were led by Shaman, who practiced the appropriate supernatural beliefs to ensure the success of the drive or hunt.

Malouf (1951:79) describes a curing Shaman who received powers in dreams inherited from parents. If the child had the same dream as the parent, he could inherit the same power. Both men and women of any age could be a Shaman. Spirits were known to communicate with the suppliant at certain caves and rock outcrops which often had pictographs painted on the rocks or cave walls.

Gosiute folklore was simple and religious hierarchy was lacking. Gosiute mythology gave orderliness to their universe by explaining social behavior and natural phenomena. These oral traditions were passed from generation to generation. While there was no origin myth, habits and characteristics of spirits were explained by mythology. Coyotes, a central character in their myths, played the role of both a hero and villain in enforcing desirable behavior.

Malouf (1951:150) describes a Circle Dance for all the Shoshoni celebrating a successful pine nut harvest in the fall. The dance lasted for five days and no pine nuts were consumed until completion of the dance. Steward (1970:139) describes a round dance held in the spring to ensure a good seed crop. It was held for five days.

Even with the rigorous battle for subsistence, the Shoshoni engaged in many games, including shinny, hoops and darts, hand games, and ball games (Malouf 1951:45). Sports such as foot races, wrestling, juggling, and gambling were social engagements held during communal events.

Historic Contacts and Development of the Reservation. Long before actual contacts, European influences were felt by Western Shoshoni and Gosiute. With Spanish entrada in 1540 and the spread of the horse to the northern Ute and Navajo, along with the promotion of slavery, the defenseless foot Indians became the target for slave raids by the mounted Ute. The slave trade flourished until 1850 when the Mormons under Brigham Young suppressed it (Fowler and Fowler 1971:103).

Fur trappers made the first white intrusion into the Gosiute territory. In 1827, Jedediah Smith (Poll et al. 1978:725) led a small group of mountain men from California to cross the Great Salt Lake Desert to reach a trapper's rendezvous northeast of Salt Lake City. The journey took the three men to the east side of Deep Creek Mountain in Gosiute territory eastward across the salt plain to the Cedar Mountains. During these travels the men noted that they had seen Indians, undoubtedly Gosiute. By 1830 the trapper's interest in the Great Basin declined. In the 1840s, other Euro-Americans were skirting the Great Basin as explorers and California immigrants. They had little effect on the Gosiute.

In 1849, two years after the Mormon arrival (1847), the Gosiute felt the pressures and modifying influences of white civilization in the Great Basin. In September 1850, Utah was created as a United States Territory and Brigham Young was its first governor and superintendent of Indian Affairs (Malouf 1951:84). The Utah Territory included the present state of Utah, Nevada, and parts of California and Wyoming. Funds that were appropriated by Congress for Indian Affairs in the territory were expended on pacifying Shoshoni in Idaho and Wyoming as well as the Utes. The Gosiute were ignored as they didn't present a problem to the Mormons.

Mormons began developing ranches in the Deep Creek area by 1852. These settlers acted as apostles to the Gosiute. Along with religious teaching, the Indians were instructed in farming techniques. As the Indians saw their land being appropriated for agriculture and livestock grazing and a decrease in game animals and foraging areas, they began to raid white settlements for food. Mormons set aside land in the Deep Creek Valley to be used by the Gosiute for farming. Due to the insistence of an Indian agent and the Mormons, some Gosiute tried farming. They were promised farm implements by the Indian agent, but they never arrived. Mormon support for the experiment ended in 1880.

White civilization began to greatly alter the Indian way of life as it overran Gosiute territory. A private mail route opened through the Deep Creek region in 1854 and was rerouted through Rush Valley. Camp Floyd was established in Cedar Valley and the Overland Mail and Pony Express established 20 stations (see Section 2.2.3).

Because the Gosiute was forced to steal or starve, they began to attack mail company stations in 1860 for food and supplies (Malouf 1951). The Utes who had been displaced began to marry the Gosiute desert people. The Utes were armed and mounted and furnished much of the leadership for the small raiding parties.

In an unsuccessful attempt to prevent the raiding, the U.S. Government supplied provisions to the mail company and the company supplied an additional \$12,000 for distribution to the Indians. The Third and part of the Second California Infantry were sent to Utah by May of 1862. They annihilated 300 Shoshoni in Idaho and then turned to contain the Gosiute in Utah. Casualties were high and the Indians subsequently were subdued.

A treaty was concluded in 1863 which was essentially a peace treaty made between the Gosiute and Western Shoshoni and the U.S. Government. It stipulated that military posts, telegraph, railroad, and stage lines, as well as mineral exploration, mining, and timbering could be established on Indian lands. It also set aside the boundaries of the Gosiute, previously described (Reagan 1934a:47). The treaty offered payment and supplies to the Indians for their land. Malouf (1951:123) states that goods were passed out at Skull Valley, but the amount was so trivial that few Indians came to collect their award.

Between 1875 and 1914 the Gosiutes were largely ignored by the federal government, even though many of the Indian agents had requested aid for the impoverished Gosiutes. Finally, by Executive Order, two reservations were established. In January 1912, President Taft set aside 80 acres (32 hectares) in Skull Valley for exclusive use of the Gosiute. Five years later it was enlarged to 17,920 acres (7252 hectares) by President Woodrow Wilson. The Deep Creek Gosiute Reserve in Tooele county and eastern Nevada was established in 1914, when President Taft allocated 34,560 acres (13,986 hectares) in Utah. In 1890 the Western Shoshoni were moved to a reserve established in north central Nevada and extending into Idaho at Duck Valley.

During the 1930s and 1940s, Bureau of Indian Affairs' (BIA) policy was to attract other Indians to the Deep Creek Reserve. In 1938 congress authorized additional lands to the Gosiute and other Indians that the Secretary of the Interior may locate there. The dissolution of Skull Valley Reservation and the relocation of these people was considered in 1938 and like efforts continued into the 1940s.

The Wheeler-Howard Act, Indian Reorganization Act (IRA), passed Congress in 1934. The Deep Creek Gosiute was organized under this Act with a constitution approved on November 25, 1940, and a corporate charter ratified March 29, 1941. This also marked the organization of the first tribal council. Attempts to organize Skull Valley under IRA have not been successful; a proposed constitution has not been ratified. However, Skull Valley has an elected tribal council recognized by the BIA (Bureau of Indian Affairs Memo 1976).

The Skull Valley people chose not to relocate even though the two groups are identified as the "Confederate Tribes of the Gosiute." The Skull Valley group is not affiliated politically with Deep Creek. Prior to 1912, fee-patented homesteads were acquired by non-Indians, primarily the Hatch Brothers Company, in the Skull Valley area. In 1949 the Hatches proposed to exchange these lands for Skull Valley Indian Tribal lands to consolidate both holdings. The exchange, completed in 1963, transferred 1800 acres (728 hectares) of Hatch land to Skull Valley. Skull Valley transferred 1978.65 acres (801 hectares) to the Hatch holdings. The entire reservation was fenced in the middle 1930s and auto gates were installed at the north and south boundaries by the Civilian Conservation Corps. Signs identifying the reservation were installed in the 1970s.

World War II had an effect on the Gosiute. Several young men entered the military service, others left the reservation to work in the potash fields in the Great Salt Lake Desert and for other war related activities. The military constructed three more installations on their ancient homeland, Dugway Proving Ground, Tooele Army Depot, and Wendover Bombing Range.

In 1946 the Indian Claims Commission provided the basis for research into the use and occupancy of American Indian lands. The Gosiute Tribe established aboriginal title to approximately 5,952,000 acres (2,408,744 hectares) in east central Nevada and western and northern Utah. Funds of \$7,300,000 were appropriated for the value of land taken and minerals removed (Bureau of Indian Affairs:1976).

The total estimated population for the Deep Creek Gosiute in 1976 was about 300 with 126 resided on the reservation. In 1975 the Skull Valley tribal membership was 72; however, few members resided on the reservation. Figure 2-4 identifies present boundaries for the Deep Creek and Skull Valley Gosiute reservations.

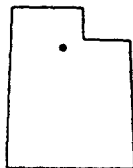
2.2.3 History

The area that today comprises Tooele Army Depot and its surroundings in many ways represents a microcosm of Utah's history, especially the shared experience of natural resource development. Mormon settlers occupied the area and began herding and farming, using nearby streams for water and power and the mountains for timber for fuel and building materials. They experienced Indian scares and non-Mormon pressures, especially in the 1860s and 1870s, as the Oquirrh Mountains yielded their mineral treasures. During the twentieth century, life returned to a slower pace as the mines closed and ranching and farming were unchallenged as the area's primary economic activities. These people, with help from nature, met with economic disaster during the 1930s as a result of the dust bowl and the Great Depression. This situation has made the U.S. Army a welcome asset since the early 1940s.

The earliest recorded Euro-Americans to enter the region were the fur trappers and traders. They first came to the Great Salt Lake shores in late 1824, and from that point until the mid-1840s, many travelled through Tooele and Rush valleys in search of beaver. Jim Bridger is credited with discovering the Great Salt Lake but accounts do not list him as one of the early visitors to the Tooele Valley. The first furman to enter the county was James Clyman in 1826, followed by Jedediah Smith and several others. Smith was the first to write about his visits to Tooele and Rush valleys, describing them as areas of lush natural pasturage (Morgan 1953:211-215; Geotzmann 1966:70, 120-126). The trappers and traders spent much of their time in what today comprises northern and northeastern Utah.

Also, 1820 to 1848 was a time when the entire area of present day Utah was under Mexican rule. Mexico inherited the Great Basin and Southwest from Spain when Castillian authority was overthrown in 1821. Spaniards were in Utah as early as 1776 when Dominguez and Escalante explored the Colorado Plateau. The party did not reach present day Tooele County, but from 1776 until the 1850s, parties from New Mexico ventured into the Great Basin to trade. In 1819, the United States recognized Spanish claims to the area in the Adams-Onis Treaty. In 1846, the United States went to war with Mexico over claims to the southwest. The Treaty of Guadalupe-Hidalgo ended the conflict, and almost the entire southwest was acquired by the United States, including all of modern Utah (Hollon 1966:51-58).

By 1848, thousands of Anglo-Americans lived throughout the southwest in California, New Mexico, and Utah. Many of those who settled in California before and after the war passed through modern Tooele County and left



DEEP CREEK INDIAN RESERVATION

SKULL VALLEY
INDIAN RESERVATION



DEEP CREEK
INDIAN RESERVATION



SCALE (MILES)

VATION

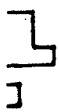


Figure 2-4. PRESENT BOUNDARIES OF DEEP CREEK
AND SKULL VALLEY GOSIUTE RESERVATIONS

journals of their experiences. Among the more well known parties to travel the area were the John Bidwell Party (1841), Donner Party (1846), Clyman-Hastings Party (1846), and Bryant Russell Party (1846) (DeVoto 1943:122-147, 463-497). Following the Mexican War, gold was discovered in California, and during 1849 thousands of people moved west to seek their fortunes at Sutter's Mill or on the American River (Paul 1963:12-19).

Retired mountain men led many of the emigrants west and also found employment as guides to federally-sponsored survey expeditions in the Great Basin during the 1840s and 1850s. Congressional interest in the West was twofold; they hoped to find new and easier travel routes, and to catalogue the flora, fauna, geology, and topography of the vast wilderness.

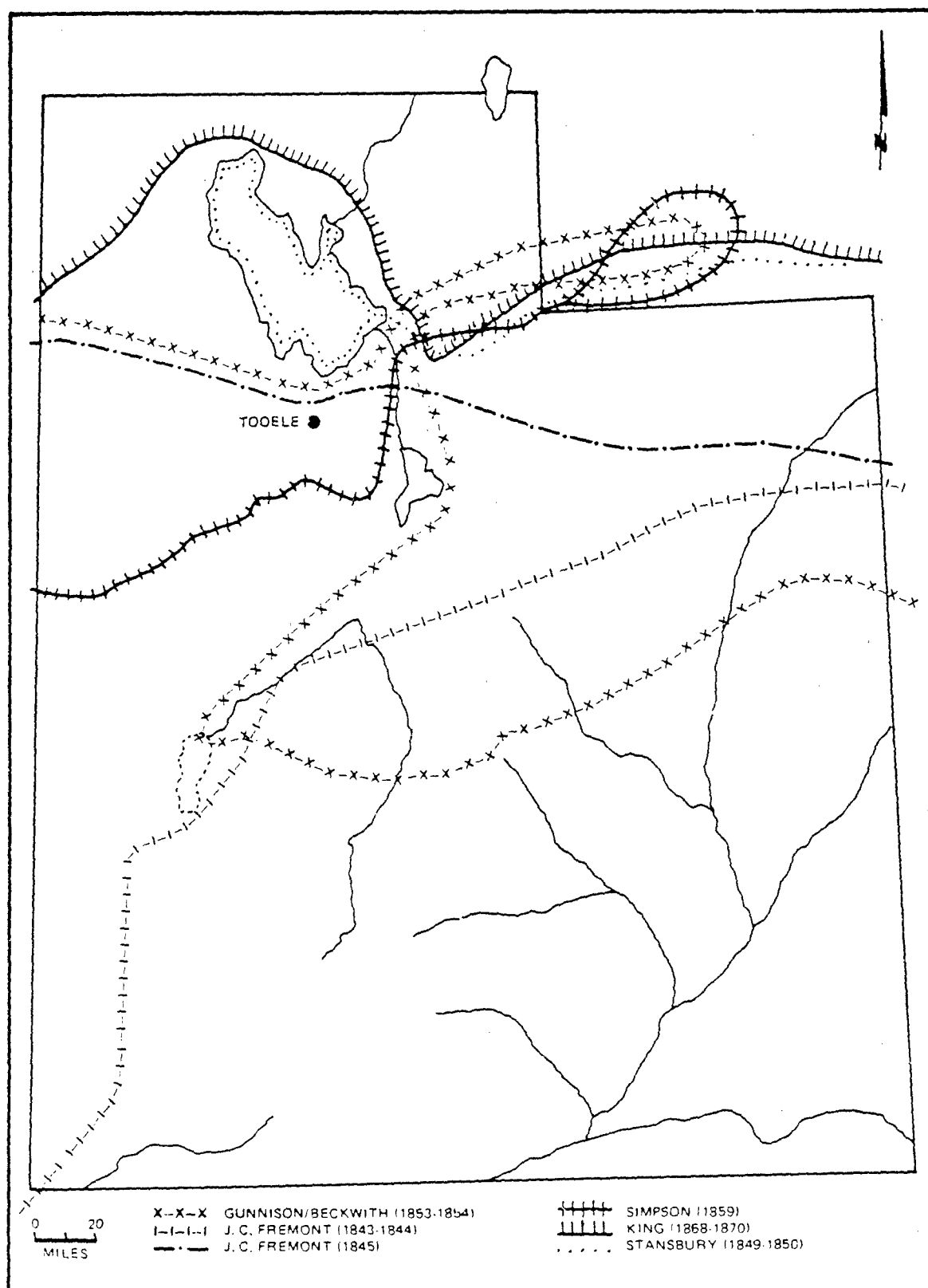
The first exploration was undertaken for the U.S. Army Corps of Topographical Engineers by John C. Fremont, who made two trips to California between 1843 and 1845. Fremont's travels provided information to compile more detailed maps of the area (Bureau of Land Management 1980, Goetzmann 1959:85-102) (Figure 2-5). The next federal explorer to reach the Great Basin was Howard Stansbury, also of the Corps of Topographical Engineers. He explored and mapped the Great Salt Lake in 1849, and as a result of his efforts, a mountain range near Tooele Army Depot bears his name (Goetzmann 1959:297-301). Stansbury's party took advantage of Mormon hospitality at Salt Lake City.

Mormon settlement of the Great Basin that began in 1847 not only eased the hardships of travelers but populated the area. The Mormon settlers used the area's natural resources to herd and farm. Nearby streams supplied water and power and the mountains supplied timber for fuel and building materials.

In 1849, the Mormons proposed that Deseret, an independent state encompassing much of the southwestern United States with a capital in Salt Lake city, be recognized. In 1851, over Mormon pleas for the Deseret statehood, Congress created the Territory of Utah. Brigham Young, President of the Mormon Church, was made Territorial Governor. Within a few years, complaints about the Mormon control of Utah from non-Mormons in and passing through Utah increased, and federal authorities appointed anti-Mormon officials for the territory (Billington 1982:536-540).

Between 1853 and 1854 Lt. John W. Gunnison led a federally-sponsored expedition across Colorado into Utah to search for a route for a Pacific Railroad. He was killed in Utah by Indians and replaced by Lt. E.G. Beckwith, who continued the survey west across the Great Salt Lake Desert and along the edges of Tooele County. Beckwith issued a negative report about the route's potential for a railroad (Goetzmann 1959:285-286, 310).

Beckwith's report probably would have ended Army interest in Utah until after the Civil War, except for outbreak of the Mormon War in 1857. In mid 1850s a series of unsympathetic territorial officials were appointed. These officials sent letters of protest to Washington, D.C. about Brigham Young and the ghost government conducted by the Church. The most offensive Mormon habit was polygamy; this protest coincided with the national slavery debate. John C. Fremont, the Republican Presidential candidate in 1856, called for the abolition of polygamy and slavery. Public opinion against the Mormons was further amplified when U.S. officials left Utah calling Brigham Young and other Mormon treasonists. Mounting pressure forced President James Buchanan to dispatch U.S. Army contingents and to suppress the "rebellion" in Utah (Billington 1982:538-543).



The Mormon War ended in 1858, however, federal officials elected to keep an army of occupation in Utah. General Albert Sidney Johnston, the officer in charge of an 1857 expedition to Utah, was instructed to find a suitable location for a permanent post near Salt Lake City. Johnston established Camp Floyd in the Cedar Valley. The Army sent members of the Corps of Topographical Engineers to search for new wagon routes to central Utah to ease supply difficulties. Captain J.H. Simpson undertook the project during 1858 and 1859 and searched for a road to California from the Great Salt Lake. Simpson's explorations were successful and overland traffic was re-routed south from Salt Lake City and west-southwest across the Rush Valley and the southern fringes of the Great Salt Lake Desert. Simpson's road was adopted for the Central Overland California Stage Company and became the standard route through western Utah until 1869, when the Pacific Railroad was completed (Goetzmann 1959:399-403, Fike and Headley 1979:1-5).

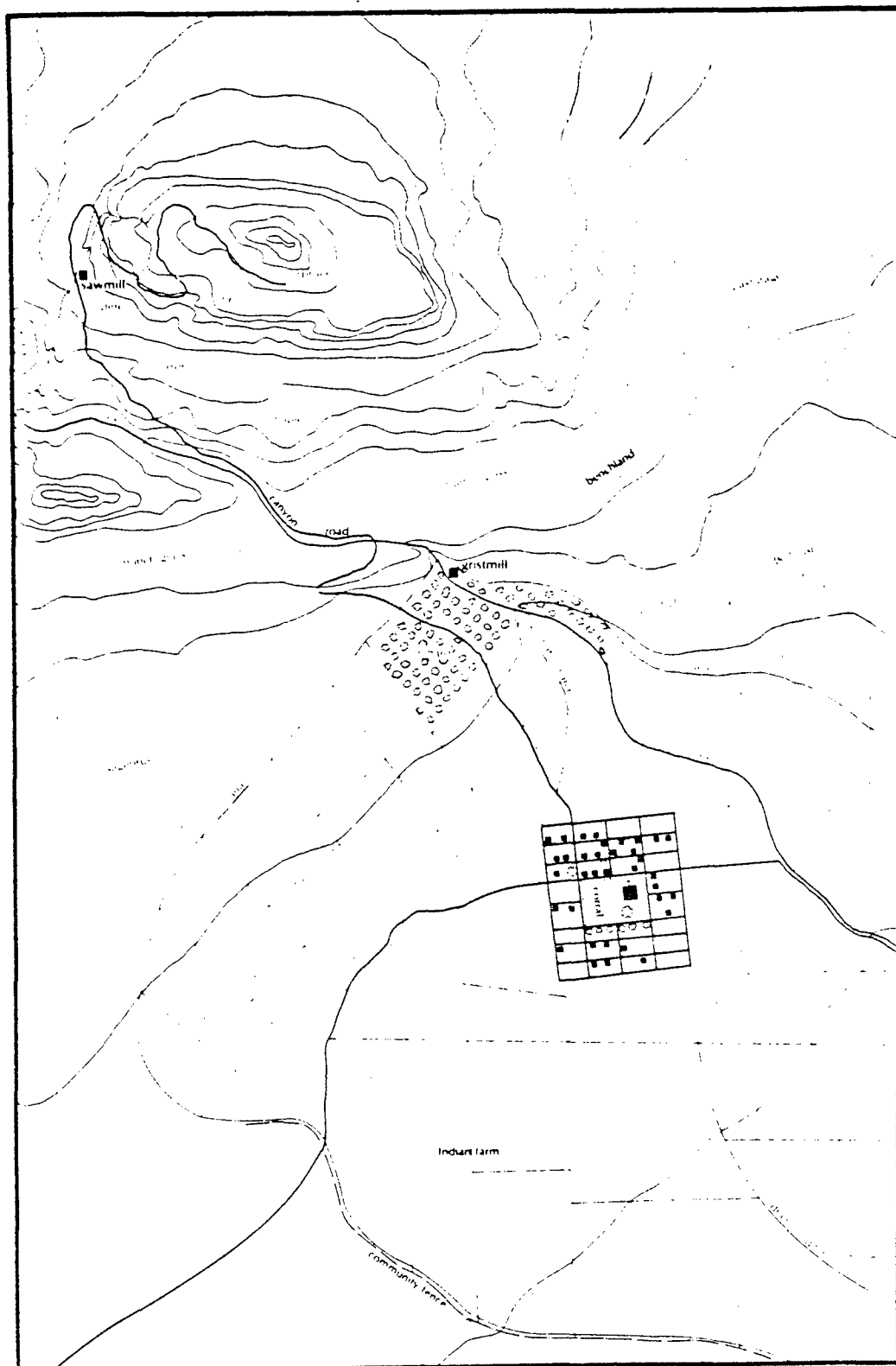
The outbreak of the Civil War in 1861 temporarily ended federal exploration in the West, and caused the abandonment of Camp Floyd. Once the war was concluded, explorers again headed West. The last major exploration to cover the Tooele County area was Clarence King's survey of the Fortieth Parallel from California to the Front Range of the Rockies. King's parties traversed the Great Basin west of Salt Lake City during the 1868 season, gathering data on the flora, fauna, and topography of the region (Schubert 1980:136-149).

Mormon Church explorers supplemented federal investigators after 1847 and one of the first areas they examined was the Tooele Valley. Both the Tooele and Rush Valleys appealed to these explorers and economic planners as areas that had access, water, pasturage, and timber, locally available from the mountains. The most attractive feature of both valleys in 1848 was the lush grasses available to graze livestock and the relatively mild winters that made the area usable year-round (Mercer 1961:14-18, 24-26).

Mormon colonizers settled in both valleys by 1850 in organized groups that built communal irrigation ditches, ran large group owned or Church-owned herds, and laid out their towns in a systematic manner. The Church's standard town plots were designed by "divine revelation" and were consistent wherever Mormons settled (Figure 2-6). Everything except personal effects was held by the church for the common good and a doctrine of prior appropriation was developed for water rights in the arid Great Basin (Mercer 1961:14-16, 26-27, Stagner 1942:25-31).

Tooele County's earliest settlers, the Joshua Call family and the Judson Tollman family and other families in the 1850s, obeyed church doctrines. By the outbreak of the Mormon War, both Tooele and Rush valleys were becoming settled and moving to the forefront in Utah livestock grazing (Mercer 1961:14-16, 26, and 340-344). The Army also took advantage of the lush meadows of the Rush Valley. As early as 1854, Col. Steptoe camped there to care for his draft animals and cavalry mounts while searching for Gunnison's murderers. Use of the Rush and Tooele Valleys by the military continued sporadically through the end of the Civil War (Mercer 1961:340-342).

The Army's horses, the Mormon herds, and animals kept at stage stations in southern Tooele County became targets for Gosiute raiding parties. Between 1860 and 1863, depredations reached alarming levels, and finally the California Volunteers, a U.S. Army detachment sent to Utah during the Civil War, retaliated. Gosiute losses were enough to convince the Indians that a



(POLL ET. AL. 1978: 733)

Figure 2-6. TYPICAL MORMON TOWNSITE - 1870

proffered peace treaty was the best alternative. Once the terms were negotiated in Utah the document was sent to Washington D.C. for ratification by the U.S. Senate. The body gave its approval in 1864 (Bureau of Land Management 1980:Mercer 1961:342-344).

Completion of the transcontinental railroad in 1869 gave eastern Tooele County stockmen the opportunity to market their animals throughout the nation and in 1871 the stockmen formed the Tooele County Stock Association (Mercer 1961:40-41). The stockmen depended on the availability of cheap grazing with adequate forage and water for their herds. Such conditions were available during the 1870s in Tooele and Rush Valleys. Initially, the stockmen used the public domain for pasturage and individuals began claiming the best lands under the various federal land disposal laws passed during the 1860s and 1870s. Grazing the range land caused it to become badly depleted by the end of the nineteenth century, and ranchers were forced to depend more on hay, alfalfa (referred to as lucern), and grain crops to feed livestock. Because most available water had been appropriated previously for orchards and other crops by area farmers, stockmen were forced to adopt dryland farming methods to raise food for livestock (Mercer 1961:41-43; Grantsville and Shambip 1976:np). During the first two decades of the twentieth century these trends of range depletion and expanded dryland farming continued.

Hawaiians were part of Tooele County ranching from 1889 to 1918. They had been missionized by Joseph F. Smith, and came to the area as Mormon Converts. The Church discouraged the Islanders from coming to Utah. Mormon officials decided to settle the Islanders on land south of Grantsville, Utah. The Hawaiians adapted their lifestyle to Utah's climate and became more adept at farming and ranching. An outbreak of leprosy threatened to cut short the colony's life, but after many deaths the disease disappeared by 1900.

During the early twentieth century, the Hawaiian settlement reached its peak population of 228, many of whom were born in Utah. In 1918, the colony's life abruptly ended when the Mormon Church built a temple in Hawaii and pressured the Utah Islanders to return to their homeland. By the end of 1918, all Hawaiians had migrated to the Pacific Islands and the church sold the land to the Deseret Livestock Company (Atkin 1958).

The development of an adequate transportation network was a critical element in the area's evolution. During the 1840s as Americans began to migrate to the Pacific Coast, the area that became Utah was one of the most used trails to California. The Central or Overland Trail to California crossed Utah and one branch of its route went down the Tooele and Rush Valleys before turning west. In 1859, Captain J.H. Simpson's new road avoided the Tooele Valley but crossed the Rush Valley east to west (Mercer 1961:4-7; Goetzmann 1959:399-403). This new route was preferred to the existing trails and the Central Overland California (COC) Stage Company rerouted its operations. The COC was owned by the company of Russell, Majors, and Waddell, who built a series of stage stations at approximately 8-mile intervals across western Utah from Salt Lake City.

Russell, Majors, and Waddell felt a system of speedier mail delivery would provide a source of profit. They initiated the Pony Express and it began operating in 1860 (Figure 2-7). It followed the stage road and used the same stations as the COC stages. The Pony Express delivered its last mail in October 1861, when the Transcontinental Telegraph that paralleled

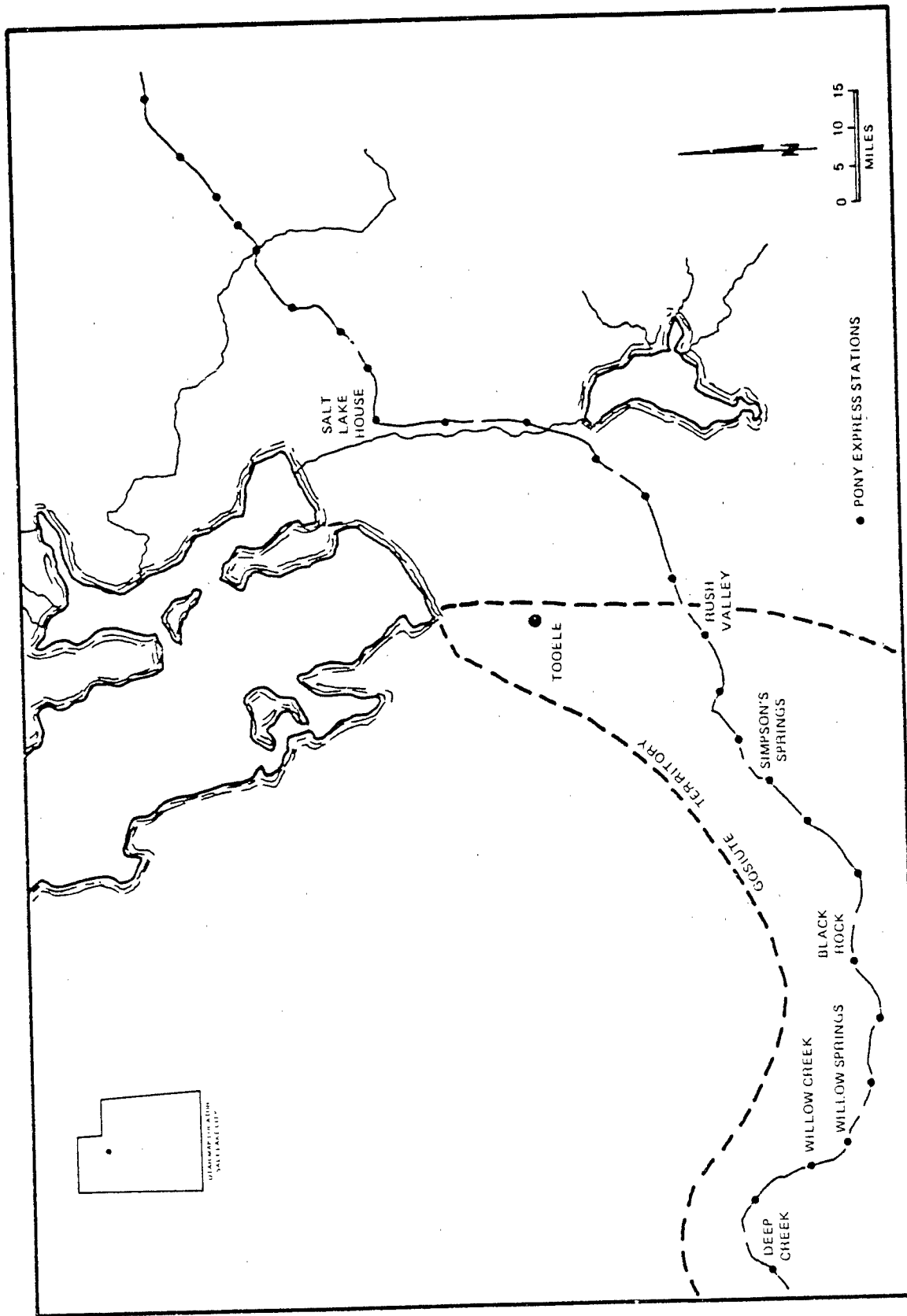


Figure 2-7. LOCATION OF PONY EXPRESS
IN GOSIUTE TERRITORY

(FIKE AND HEADLY 1979: 111)

its road was completed. The Pony Express proved to be such a financial drain on Russell, Majors, and Waddell that the trio was forced to sell the stage line to Ben Holliday, who in turn sold out to Wells, Fargo, and Company (Kungerford 1949, Carter 1952). Wells Fargo continued to service the route, but their through traffic greatly diminished after completion of the Pacific Railroad (Union Pacific - Central Pacific) at Promontory Summit, Utah in May 1869.

The railroads ushered in a new era for all Utahans, including residents of Tooele County (Athearn, 1971:95-103, 265). The railroad opened distant markets to area stockmen, forced the federal government to open a land office in Salt Lake City to dispose of the public domain, caused a great influx of non-Mormons, and helped stimulate interest in Tooele County mining (Athearn 1971:85) (Figure 2-8).

The area's mines caused more railroad building in Utah, and in 1875 a branchline from Salt Lake City, the Utah Western, was completed to Stockton. The Utah Western later became a subsidiary of the Union Pacific. The Salt Lake and Los Angeles railroad, built in the early twentieth century, runs from north to south serving both posts of Tooele Army Depot. The other railroad to serve Tooele County, the Western Pacific, was completed in 1910. Like the earlier roads, both the Salt Lake and Los Angeles and the Western Pacific are now part of the Union Pacific (Bureau of Land Management 1980) (Figure 2-9).

Completion of Tooele County's rail network coincided with the beginnings of the automobile age in Utah, the final phase of ground transportation development. The first cars appeared on American roads during the 1890s. By the end of 1903, Dr. Horatio N. Jackson completed the first coast to coast tour by car and demands were made for improved highways. The Lincoln Highway, completed in 1918, and the Victory Highway, now Interstate 80, finished in 1925 (Bureau of Land Management 1980), provided Tooele County with access to two national highways.

Gold and silver prospecting started during the early 1860s when Col. Patrick Connor and the California Volunteers were assigned to guard the Overland Trail in Utah and replace the troops once stationed at Camp Floyd in their surveillance of the Mormons. Connor and his men had been recruited from the California gold fields and soon after their arrival in Utah, began to use their previous training in mining to examine Utah's mountains. Connor encouraged his troops to spend their off-duty hours prospecting, thinking that mineral discoveries would create a rush of new residents that would dilute Mormon strength. Between 1862 and 1865, numerous gold and silver outcroppings were found, and by 1865 Jacob City, the first mining town in the Oquirrh Mountains, was established. A series of mining camps were established between 1865 and 1895: Mercer 1869, Ophir 1870, Clifton 1872, Gold Hill 1889, Sunshine 1893, and West Dip 1895 (Carr 1972:20-24, 28).

The towns of Tooele and St. John evolved from quiet farming communities into bustling supply hubs for the miners. Stockton, named after Col. Connor's hometown in California, was founded at this time as a smelting and supply center. Tooele County farmers sold foodstuffs and hay to miners. The smelters at Stockton, and later Tooele, also offered employment and a chance to supplement farm income. Local lumbering became more active as the smelters increased their needs for charcoal. The Oquirrh Mountains' mines also brought eastern and foreign capital into the area. Among the more

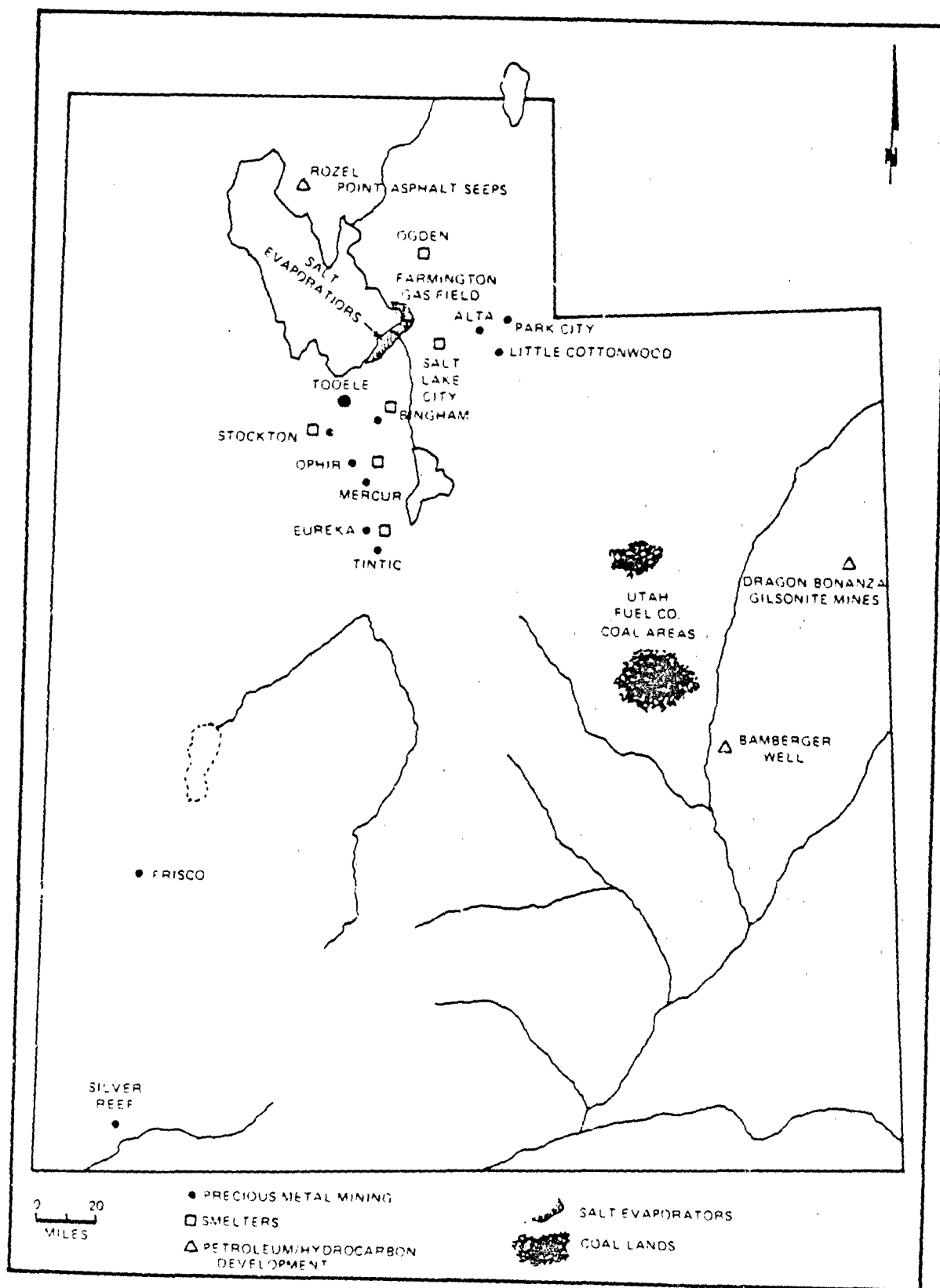


Figure 2-8. 19TH CENTURY UTAH MINERAL DEVELOPMENT

famous investors were William A. Clark, Montana copper magnate, who helped finance and build the San Pedro, Los Angeles, and Salt Lake Railroad, and Jay Gould, rail promoter and entrepreneur. Mining remained important in the area into the early twentieth century, but by 1900 Utah geologists began to focus more of their attention on other deposits such as copper (Carr 1972: 25-29; and Bureau of Land Management 1980).

Agriculture, both ranching and farming, were the primary pursuits of Tooele County residents when World War I began in 1914. When the war was over, a financial panic swept the nation and Tooele County agrarians responded by further increasing output to augment falling prices. However, more production led to further market gluts and low prices. This cycle continued through the rest of the decade. In 1929 the New York Stock Exchange crashed and the Great Depression began. By the mid-1930s, Tooele County had the highest per capita welfare ratio of any Utah county. This was furthered by the drought and dust bowl that ravaged the fields and over-grazed rangelands of the valleys. Only intervention of the federal government through President Franklin D. Roosevelt's New Deal kept Tooele County from total collapse. The Soil Conservation Service and the Civilian Conservation Corps undertook programs to control erosion and reseed the dust bowl area. It took many years for the rangelands to regain the ability to support herds. During the interim, the U.S. Army established the Tooele facilities in the area that improved the economy for the people of Tooele County (Grantsville and Shambip 1976 197:np, and Bureau of Land Management 1980:, Alexander 1978:486).

President Roosevelt began a program of rearmament in 1941. Officials of the Chemical Warfare Service (CWS) and Ordnance Corps needed more space for storage and service of war materiel. Central Utah drew their attention because of its isolated areas and distance from the Pacific Coast. During early 1942, the Army bought 24,732 acres (10,009 hectares) from the State of Utah, the Grantsville Soil Conservation District, and private owners near the town of Tooele. At the same time, other military officials were securing title to another 4100 acres (1659 hectares) in the Rush Valley. Construction on both posts commenced early in 1942 and continued at various levels throughout most of the war.

In addition to the military facilities, the Army was forced to supply housing and services for the workers employed at the bases. Employment by the Army eliminated Tooele County's unemployment problem. Between 1940 and 1945 the City of Tooele nearly tripled in population as labor shortages occurred and workers from elsewhere relocated to the city.

Victory by allied forces in World War II led to redefinition of tasks for the bases, with greater emphasis on disposal of war materiel and long-term weapons storage. Both installations have maintained a continuing role in Army preparedness systems. One result of this has been the remodeling and upgrading of both military and housing facilities at the installations. In 1955, Deseret Chemical Depot was merged with Tooele Ordnance Depot and the combined facilities were renamed Tooele Army Depot. Over the years since 1942, dozens of functions at the Depot have been added and/or deleted and its position in the Army's table of organization fluctuated until U.S. Army Materiel Development and Readiness Command (DARCOM) was organized in 1962. Today the base remains a primary source of income in Tooele County and serves the needs of today's technology-oriented Army (Arrington and Alexander 1963:3-25, 1964:32-40). The cultural chronology of the area is summarized in Table 2-2.

Table 2-2. A SUMMARY OF THE CULTURAL CHRONOLOGY OF THE AREA OF TODELE ARMY DEPOT

Cultural Unit		Date	General Settlement Patterns	General Subsistence System	Kinds of Archeological Remains Representative of Period
Tradition	Period or Phase				
American	Post-Great Depression	AD 1940 to Present	Development of Army bases. Period of general prosperity. Continuation of mechanized agriculture. Intensive suburbanization. Decline in number of farmsteads.	Industries, transportation, service trades, agriculture, commerce.	Anglo-American manufactured goods including railroad, auto, farm, aircraft parts, seamless and seamed cans, clear glass, machine-made bottles, plastic goods. Milled lumber, concrete, brick.
	Statehood	AD 1890 to 1940	Period of rapid but sporadic urban growth, marked by depressions and some overall out-migration. Beginnings of suburbanization. Compact farming units.	Industries, transportation, service trades, agriculture, commerce.	Anglo-American manufactured goods including molded-relief ceramics, colored glass, wire nails, canning jars with rubber seals, iron and steel farm implements, early auto parts, leather goods/harness. Milled lumber, concrete, brick.
	Trans-continental	AD 1869 to 1890	Period of rapid growth, especially in transportation, ranching and farming, with urbanized areas and compacted farm units/settlements.	Agriculture, livestock ranching, service trades, transportation, home/small industry, commerce.	Dramatic increase in manufactured goods, soldered tin cans, ceramics and colored glass, iron and steel implements with wooden parts, leather goods/harness. Milled lumber/bricks.
Mormon	Settlement	AD 1847 to 1869	Period of cluster settlements, beginnings of intensive agriculture, herding and communal enterprises.	Agriculture, general livestock herding, home manufacture, trade.	Domestic manufactures, limited quantities of imported goods, adobe and log construction.

Table 2-2. A SUMMARY OF THE CULTURAL CHRONOLOGY OF THE AREA OF TOUELE ARMY DEPOT (Continued)

Cultural Unit			General Settlement Patterns	General Subsistence System	Kinds of Archeological Remains Representative of Period
Tradition	Period or Phase	Date			
Post-Formative Stage	Numic Western Shoshone	AD 780(?) to present	Basic patterns described by Steward (1970). Based on the seasonal collection of wild plants and periodic hunting. A system in which small groups moved from one resource to another as resource availability dictated.	Hunting and gathering	Lithic scatters and ground stone tools. Use of rock shelters and caves. Rock art where suitable surfaces are available. Campsites in Pinyon regions. Game drives storage pits. Brown ware ceramics. Wickiup structures in mountains. Introduction of Anglo and American American iron and glass products ca. 1820.
Formative Stage	Fremont/Great Salt Lake	AD 780(?) to AD 1260	Heavy emphasis on lakeside adaptation and in areas of high salt content in soils. All sites seem to be seasonally occupied.	Heavy emphasis on hunting and fishing, seed collecting and water fowling. Light emphasis on horticulture.	Four site types: (1) Horticultural (2) Non-horticultural and rock art sites, (3) Sites without discernable features, and (4) Cave sites.
Archaic	Late/Archaic	1500 BC to 550 BC	A pattern similar to that proposed by Steward with the exception of Pinyon exploitation.	Upland hunting and gathering. Little use of lake margins - population reduced/regional abandonment.	Lithic scatters, game drives, campsites, grinding stones, possible rock art. Cavesites and rock shelters of major importance.
	Middle/Archaic	3500 BC to 1500 BC	As above.	Upland hunting and gathering as well as lake edge exploitation of resources.	Cave sites and rock shelters. Lithic scatters, campsites.
	Early/Archaic	6500 BC to 3500 BC	Sedentary lifestyle.	Exclusive exploitation of lake edge and marsh resources.	Cavesites, rock shelters. Heavily exploited at long periods of time.
Lithic	Paleo-Indian	10,000 BC to 6500 BC	Not well known in Utah.	Not well known. Probably big game hunting and lake edge exploitation.	Only materials found to date are isolated surface findings.

2.3 ARCHEOLOGICAL RESEARCH DIRECTIONS

2.3.1 Regional Concerns

Archeological interest in the Great Salt Lake Region dates back to the last century (James 1980). However, excavation of significance did not commence until 1915, when Neil W. Judd excavated a mound site one mile west of Willard, Utah. From 1915 until World War II, most of the work of Judd and others in the area concentrated on the need to gather data on the prehistory of the area (Judd 1917; Steward 1931, 1933, 1936, 1937; Gillin 1936, 1941; Smith 1938; and Reagan 1934b).

Although it is popular today to emphasize problem orientation in research, the idea is not new. Judd's (1917) work was specifically oriented to determining the nature of the Willard Mounds. Steward's (1931, 1933) was conducted "... with the aim of discovering ancient cultures which could be dated by references to the chronology of the (Bonneville) Lake."

A major program involving the development of a statewide inventory was initiated in 1950. Jack R. Rudy conducted the first areal survey under this program (Rudy 1953).

In the early 1950s, research in the basin took a dramatic turn with the excavation of Danger Cave near Wendover (Jennings 1957). This site coupled with the ethnographic work of Julian Steward (1970) formed the basis of Jennings's (1964) Desert Culture Concept. This concept embodied the idea that cultural adaptations in the basin have been relatively stable from the end of the Pleistocene period to around the time of Christ, and that Steward's 1938 model of Shoshone adaptations was applicable to the total span of post Paleo-Indian or Archaic occupation of the basin. Aiken's (1970) work at Hogup Cave seemed to confirm the conclusions reached at Danger Cave. In Steward's model, Shoshone peoples clustered into base camps or villages during the winter months, living on stores of pinyon nuts harvested in the fall. In the spring, when food resources were exhausted, the groups divided into small nuclear-family groups and spread over the landscape. In the fall, when the pinyon nuts were ready to be harvested, the small family groups gathered into the larger groups once again, completing the annual cycle.

Madsen (1982), using a variety of evidence, has proposed a three-period archaic stage in which he documents a shift from the exploitation of lacustrine resources to the exploitation of upland resources. This shift is due, according to Madsen, to changing climate conditions and their effect on lake edge lands in the Great Salt Lake Basin. He also notes the exploitation of pinyon nuts, a major staple in Steward's model, seems to be essentially a Shoshone phenomenon.

The history of Tooele Valley and Rush Valley has been studied in the past with primary focuses on thematic or topical concerns such as the development of agriculture or mining. An adequate synthetic history of the area is missing. Other specific topics of regional concern need reinterpretation. Present evaluations frequently lack adequate scholarly perspective, and start with the supposition that mining was anti-Mormon. A study of Tooele County is needed with a fresh perspective to create a less biased interpretation of the area's history.

Regional Research Questions - There are a series of basic regional research questions to be resolved for the general area:

1. How far east does the Western Pluvial Lakes tradition extend? What is the nature of the Paleo-Indian/Archaic interface?
2. What is the nature of the altithermal and what is its effect on both a regional and local basis?
3. Where did the Fremont culture come from? What is the nature of its regional variations; is Marwitt correct when he separates the Great Salt Lake variant from the Sevier variant, or is Madsen right when he keeps them together?
4. The disappearance of the Fremont is of equal importance. Did the Fremont peoples migrate out of the area, if so, to where; or did they drop horticulture and "become" Shoshone?
5. What is the nature and role of "Plains" influence in northeastern Utah?

2.3.2 Installation-Specific Archeological Research Directions

Site-specific research concerns for Tooele Army Depot are limited because of several factors:

1. The comparatively small area of the two posts in comparison to their respective valleys;
2. The large amount of construction that has taken place on the posts;
3. The massive destruction of top soil during the 1930s when up to 15 in. (38 cm) of soil blew away. This was particularly true at the North Post but the South Post was affected as well. The replacement of natural vegetation by quick growing grasses means there is little in the modern environment that has any significance in terms of prehistoric site location.

On the other hand, Steward in the early 1930s prior to installation construction and the dust bowl, excavated a Fremont site (Grantsville House Mounds 3, 4, 5, 6, and 9) on what is the North Post. If portions of this site are intact, reexamination of this critical site could answer questions dealing with Fremont regional variant homogeneity. Does Madsen's Sevier/Fremont dichotomy hold true or are there significant differences between the Fremont found north and east of the Great Salt Lake and the Fremont found south of the Great Salt Lake to justify Marwitts (1970) separation of Great Salt Lake Fremont from Sevier Fremont.

Site-specific historic research concerns for Tooele Army Depot are similarly limited for the reasons discussed above. However, questions that would facilitate future historic inquiry include:

1. Can historic archeology develop a specific chronological evolution of land use in the two valleys. Of special concern is the application of the standard Mormon mud-walled town plan to Tooele. What were the lands of the North Post used for under the Mormon system over time? Why did the uses change if they did?

2. Can evidences of the impacts of mining and related refining and service industries be found on the posts? If evidences are found, can they help establish ethnic patterns associated with typical western mining camps or was the Tooele County experience unique in that regard?
3. Can evidences to support or refute early records of range conditions be found? Were the valleys in 1850 actually the grazing paradises they are portrayed to be?
4. Can evidences of early dry land farming in the area be found and can these help formulate a reinverpretaion of the present understanding of pioneer dry land farming methods?

For any research design to be successful, the following basic criteria must be met: 1) the research problem(s) must be clearly defined, 2) a testable hypothesis must be clearly stated and related to the problem(s) posed, 3) the nature, amount, and extent of data needed to test the hypothesis must be determined, 4) the research problem(s) should be prioritized, and 5) specific resource selection for survey, evaluation, or data recovery should be based on the specific research problem.

The most difficult of all of the above criteria is the formulation of the research problem. If it is properly formulated as a series of specific questions, then the other criteria, i.e., nature, amount, and extent of data, can be more easily derived. To facilitate this process, Fowler and James (1981) have proposed an hierarchial organization of questions as a general research design organization for the Great Basin. This organization is set forth below (Janetski and Holmer 1982:97).

- I. Problem Domain 1
 - A. Research Topic 1
 1. Research Question
 - a. Data Requirement
 2. Research Question
 - a. Data Requirement
 3. etc.
 - B. Research Topic 2
 1. Research Question
 - a. Data Requirement
 2. etc.
- II. Problem Domain 2
 - A. Research Topic
 1. Research Question
 - a. Data Requirement
 - B. etc.
- III. etc.

Richard N. Holmer (Janetski and Holmer 1982) has used this format and has identified seven main problem domains. These include:

- A. Chronology
- B. Settlement and Subsistence
- C. Cultural Relationships

- D. Demography
- E. Environment
- F. Technology and Material Culture
- G. Data Recovery Techniques

Based on the evidence currently available, the sorts of questions outlined on Table 2-3 could be raised. Obviously the numbers of questions that could be posed is limitless. However, to have meaning the questions require a data base, and the questions posed in Table 2-3 might reasonably be answered based on the data known to exist on-post. Additional finds of a different nature than those known to exist would pose different questions.

Table 2-3. RESEARCH DESIGN: PROBLEM DOMAINS AND DATA REQUIREMENTS FOR THE TOOELE ARMY DEPOT

<u>Problem Domain</u>	<u>Research Topic</u>	<u>Research Question</u>	<u>Data Requirements</u>
I. Chronology	A. Projectile Points	1. What is the date range of Rose Spring and related projectile points in the study area?	1. Points should be in a datable context, i.e., with datable materials such as: a. Open sites with evidence of fire b. Multi-component sites with subsurface materials
		2. What is the date range of Desert Side-notched points in the study area?	2. As above
		3. What other types of points (what is these date range) occur in the study area?	3. As above
	B. Ceramics	1. What is the earliest date for ceramics in the area?	1. As above
		2. What is the earliest date for painted/decorated ceramics in the area?	2. As above
		3. What is the date range for the "supposed numic" brown wares in the area?	3. As above
II. Settlement and Subsistence	A. Fremont Occupation	1. What plant and animal resources are associated with Fremont materials in the study area?	1. Open sites with charred remains
		2. What tool types are associated with diagnostic Fremont artifacts?	2. Sites with multi-activity loci
	B. Numic Occupation	1. Same questions as for Fremont	1. Same data requirements as for Fremont

Table 2-3. RESEARCH DESIGN: PROBLEM DOMAINS AND DATA REQUIREMENTS FOR THE TUELE ARMY DEPOT (Continued)

<u>Problem Domain</u>	<u>Research Topic</u>	<u>Research Question</u>	<u>Data Requirements</u>
III. Cultural Relationships	A. Archaic/Fremont Interface	<ol style="list-style-type: none"> 1. Do diagnostic Fremont artifacts follow archaic diagnostic artifacts in an unbroken succession. 2. or, Do they occur in direct association with each other? 3. or, Do they occur in a broken succession (with a "hiatus") with each other? 	<ol style="list-style-type: none"> 1. Open sites with subsurface components 2. As above 3. As above
IV. Demography	B. Fremont/Numic Interface	<ol style="list-style-type: none"> 1. Same questions as for Archaic/Fremont interface. <p>The data base, i.e., amount of potential undisturbed land is in all probability too small to provide useful data.</p>	<ol style="list-style-type: none"> 1. Same data requirements as for Archaic/Fremont interface.
V. Environment	A. Population Fluctuations	The massive erosion of the 1930's dust bowl and the successive revegetation of the area has in all probability destroyed any chance of recovering meaningful environmental data.	
	A. Lacustrine Environments		
VI. Technology and Material Culture	A. Lithic Materials	<ol style="list-style-type: none"> 1. What raw materials were used in making stone tools? 2. What were the sources of the raw materials? 	<ol style="list-style-type: none"> 1. Lithic Source Analysis/Debitage analysis 2. Regional survey to locate quarry sites and/or lithic sources
VII. Data Recovery	A. Survey Results (Surface)	<ol style="list-style-type: none"> 1. Can house mounds and other surface features be located through use of aerial remote sensing techniques? 	<ol style="list-style-type: none"> 1. Aerial survey/test at variety of scales and emulsions plus ground truth
	B. Survey Results (Subsurface)	<ol style="list-style-type: none"> 2. Can archeological features (subsurface) be located through the use of aerial remote sensing techniques? 	<ol style="list-style-type: none"> 2. As above

SECTION 3

CHAPTER 3.0 AN ASSESSMENT OF ARCHEOLOGICAL RESOURCE PRESERVATION AND SURVEY ADEQUACY

3.1 ENVIRONMENTAL CONSTRAINTS TO SITE PRESERVATION

The North and South Posts are situated in fault block valleys (Tooele Valley and Rush Valley, respectively) that receive intermittent to continuous deposition, creating a potential for rapid site burial and preservation. However, the valley floor deposits are not consolidated and are subject to massive erosion.

3.2 HISTORIC AND RECENT LAND USE PATTERNS

Ground disturbing activities at both posts of Tooele Army Depot share a common history. For almost 90 years prior to Army acquisition of the area lands were heavily grazed. This overgrazing led to wind and water erosion after the natural forage disappeared. The drought years of the early 1930's marked the severest episode of this erosion with the Tooele Valley losing an average of 15 in. (38 cm) of topsoil as clouds of dust. Estimates for the Rush Valley are not as high. Soil conservation and re-vegetation efforts of the 1930's further disturbed the ground in attempts to recontour and halt erosion.

The Army became the primary source of ground disturbing activity after 1942. In 1983, the South Post experienced severe water erosion. In addition to these problems, the construction of storage igloos, demolition pits, and open storage areas has radically altered the contours and land profiles of the two posts. Further disturbance, especially at the South Post, is connected with the deep burial of toxic munitions. Only limited areas of the post can be considered undisturbed, assuming the wind erosion has not been totally destructive. The North Post has experienced equally destructive disturbances and only limited areas remain untouched. Again, it is assumed wind erosion of the 1930s was not totally destructive of sites (Figures 3-1 and 3-2, Tables 3-1 and 3-2).

3.3 PREVIOUS CULTURAL RESOURCE INVESTIGATIONS: COVERAGE AND INTENSITY

Julian Steward excavated a series of house mounds (Fremont Culture) in the 1930s and some of these mounds are located on the North Post. Unfortunately there are no site forms on file for these sites. The only record is Steward's (1933) Early Inhabitants of Western Utah, Part I, Mounds and House Types published by the University of Utah.

3.4 SUMMARY ASSESSMENT OF DATA ADEQUACY, GAPS

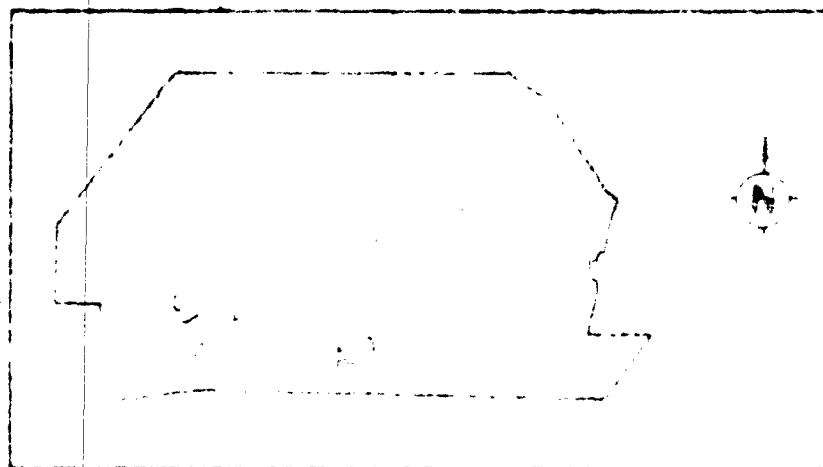
The research team was shown a large boulder at the North Post whose upper surface was covered with petroglyphs. Their age, cultural affiliation, and functions have yet to be determined. The team also visited some of the

TOOELE ARMY DEPOT

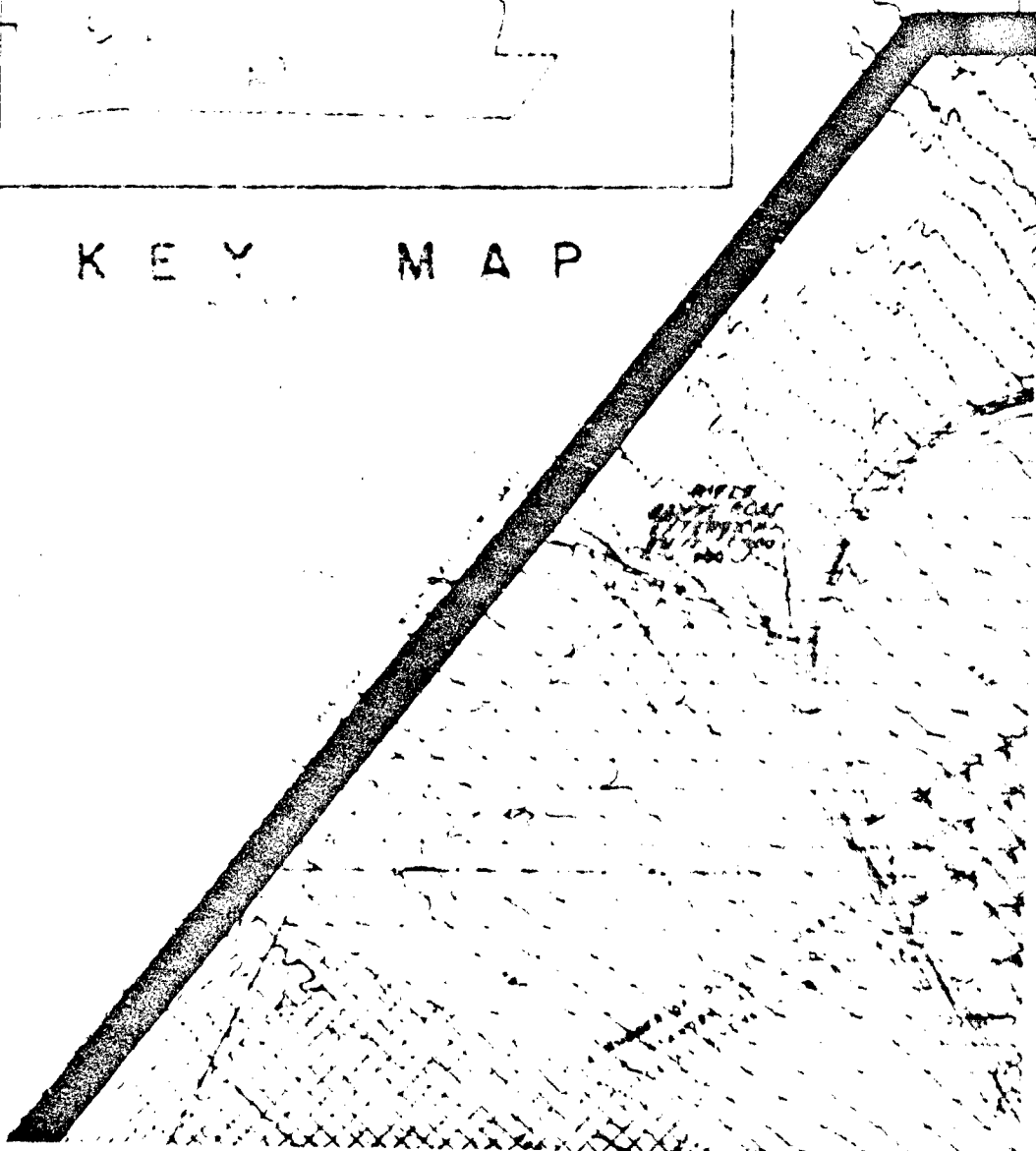
NORTH POST

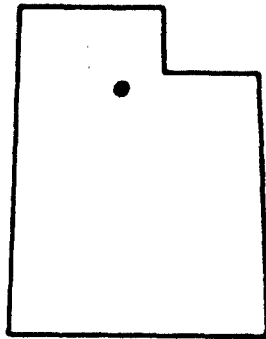
**Figure 3-1 HISTORICAL
AND
PRESENT GROUND DISTURBANCE**

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33000
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13000
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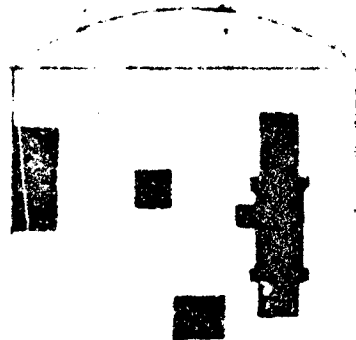


KEY MAP





UTAH MAP LOCATOR
SALT LAKE CITY



AND FURNACE CITY

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11-21-60

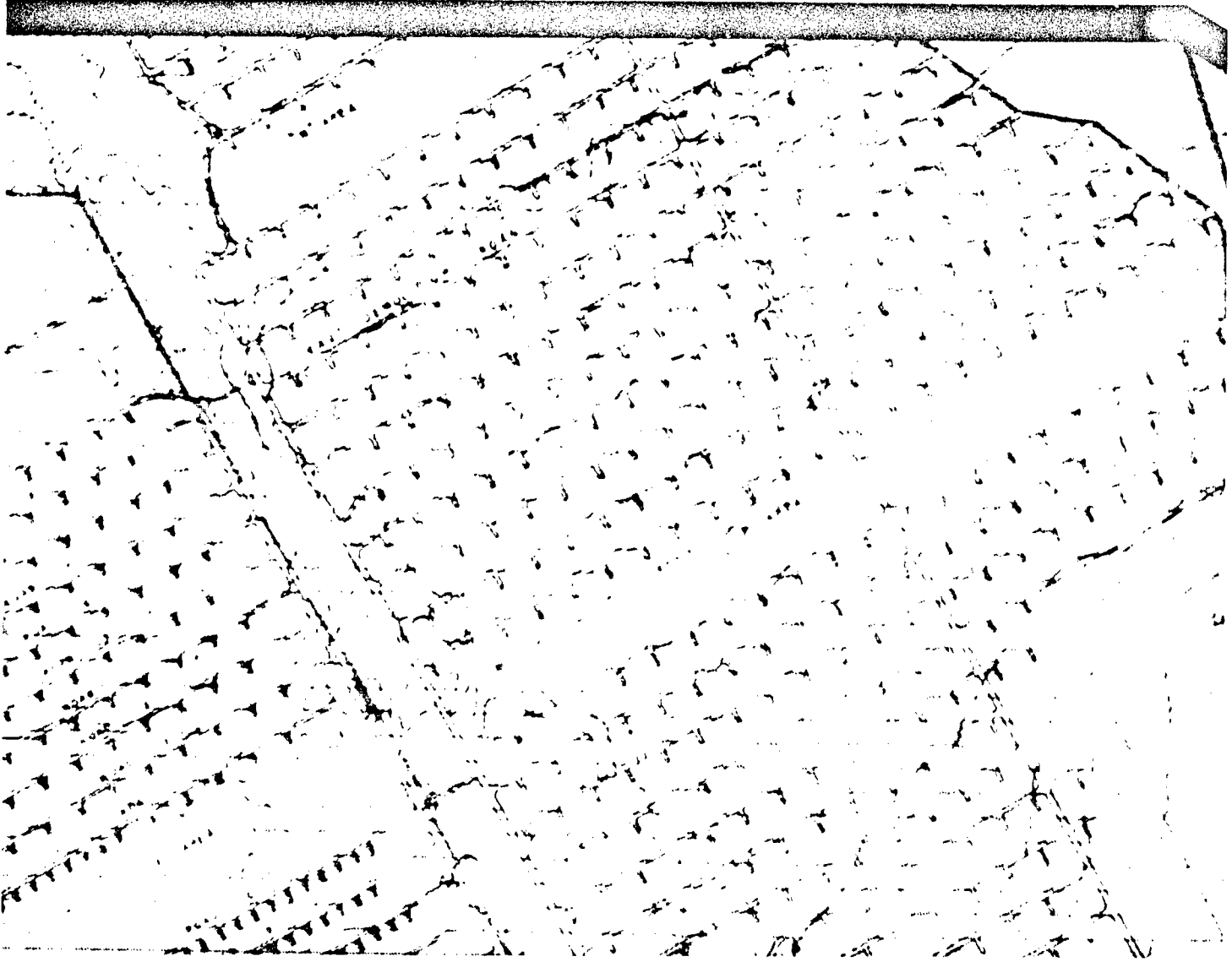
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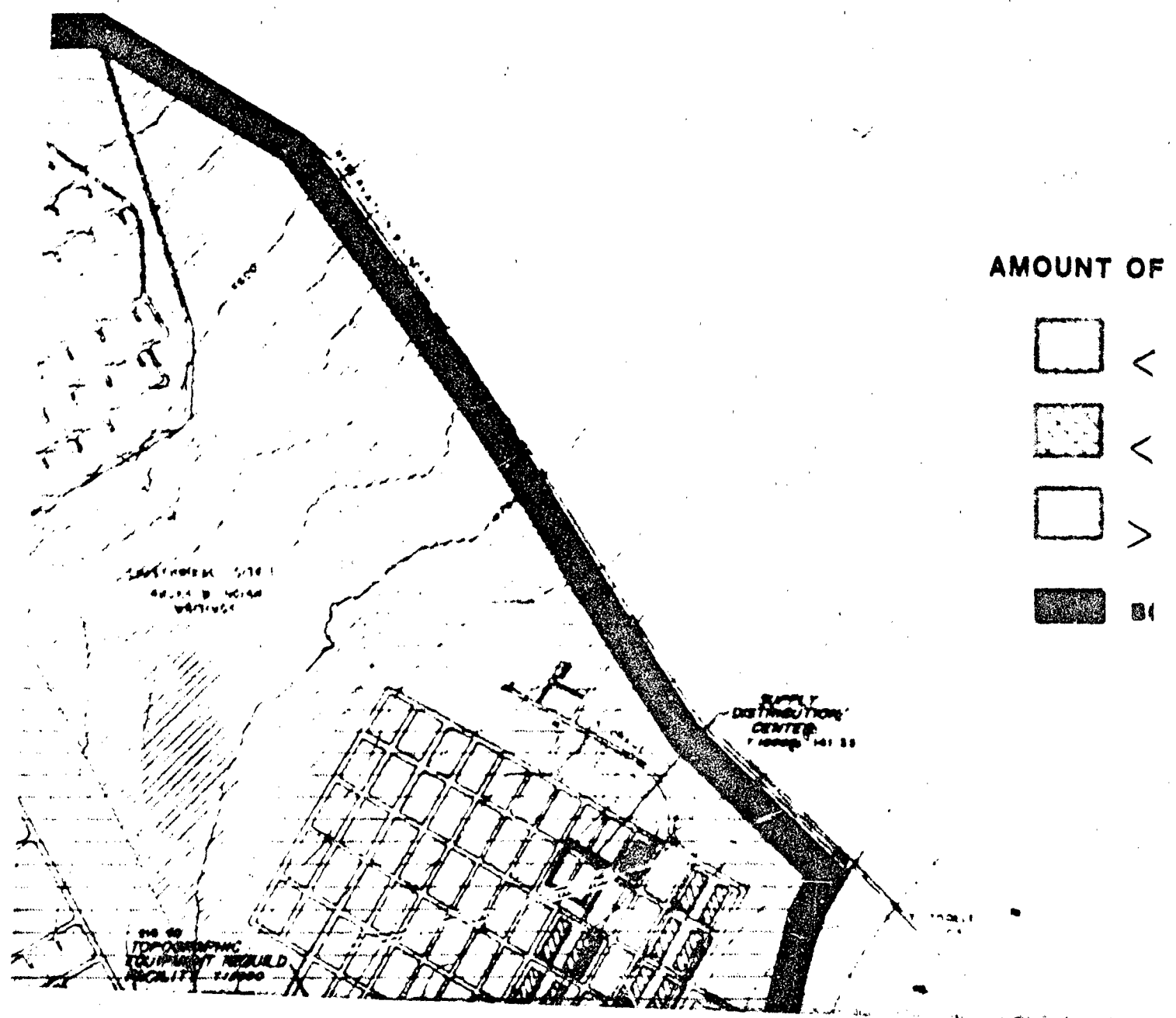
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**Figure 3-1. HISTORIC AND PRESENT GROUND
TOOELE ARMY DEPOT - NO**



LENDIAN

IC AND PRESENT GROUND DISTURBANCE OELE ARMY DEPOT - NORTH POST

AMOUNT OF DISTURBANCE



< 30% < 12 in. (30 cm) DEEP



< 30%, 6 in. to 3 ft. (15 cm to 0.9 m) DEEP

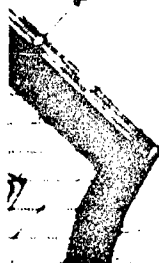


> 90%, GREATER THAN 6 ft. (1.8 m) DEEP



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GDA-2

6

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MODERNIZATION
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CONSTRUCTION MONITORING
PHASE 2-4 1-2000

SURVEILLANCE SHOP
PL 2-4 1-2000
21,405 SF

ARMOR HANDLING BLDG
PL 2-4 1-2000
15,940 SF
(NOW COMPLETE)

CONSOLIDATED REDEYE
BL 10 1-2000 5,340 SF

EXTENDED
BL 10 1-2000 5,340 SF



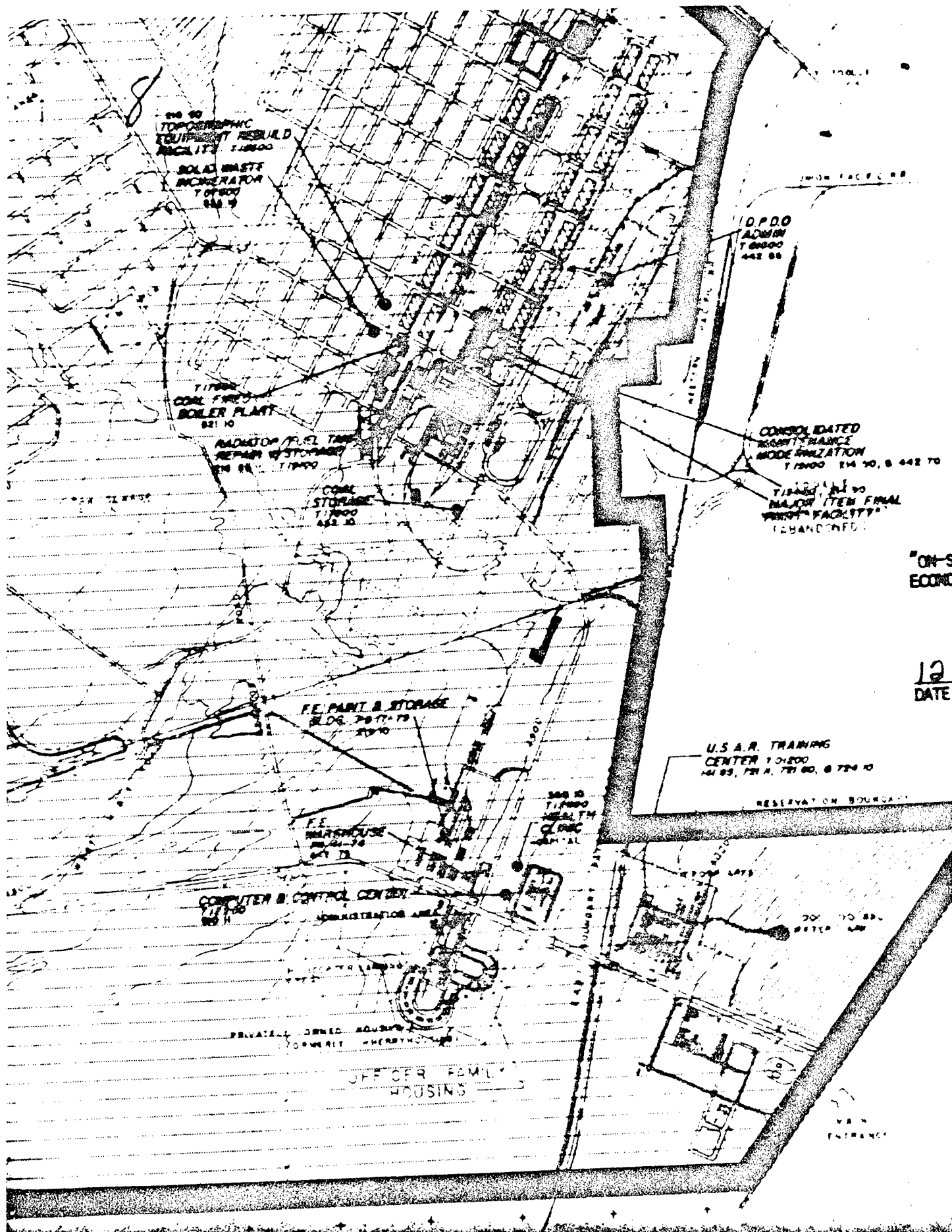
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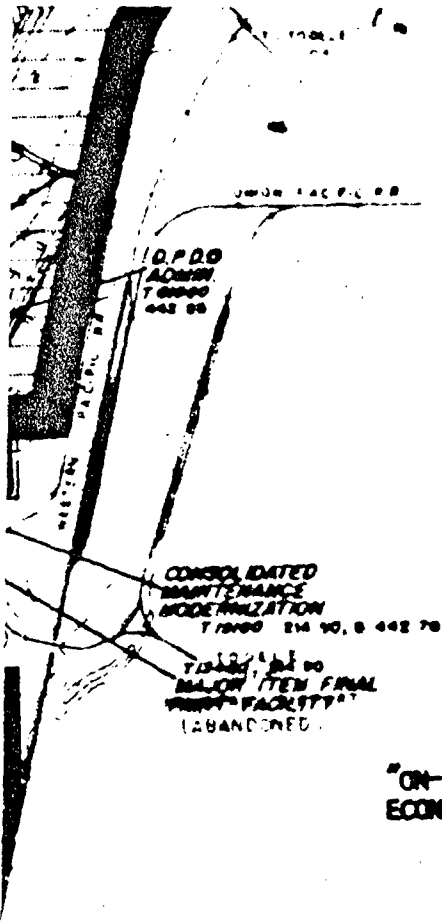
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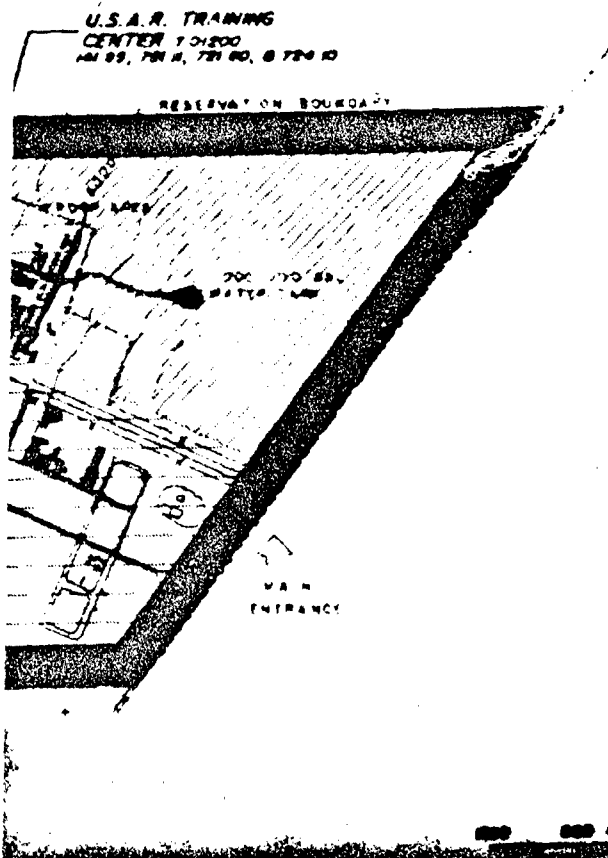
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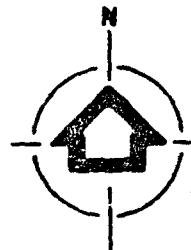
12 Aug 1982
DATE

Dennis E. Bingham
DENNIS E. BINGHAM
CHIEF, FACILITIES ENGINEERING DIVISION



NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN.



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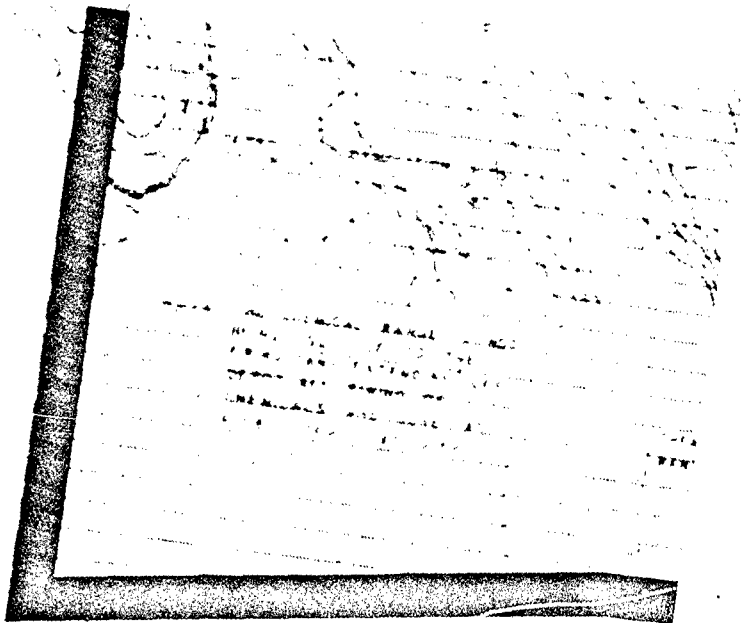
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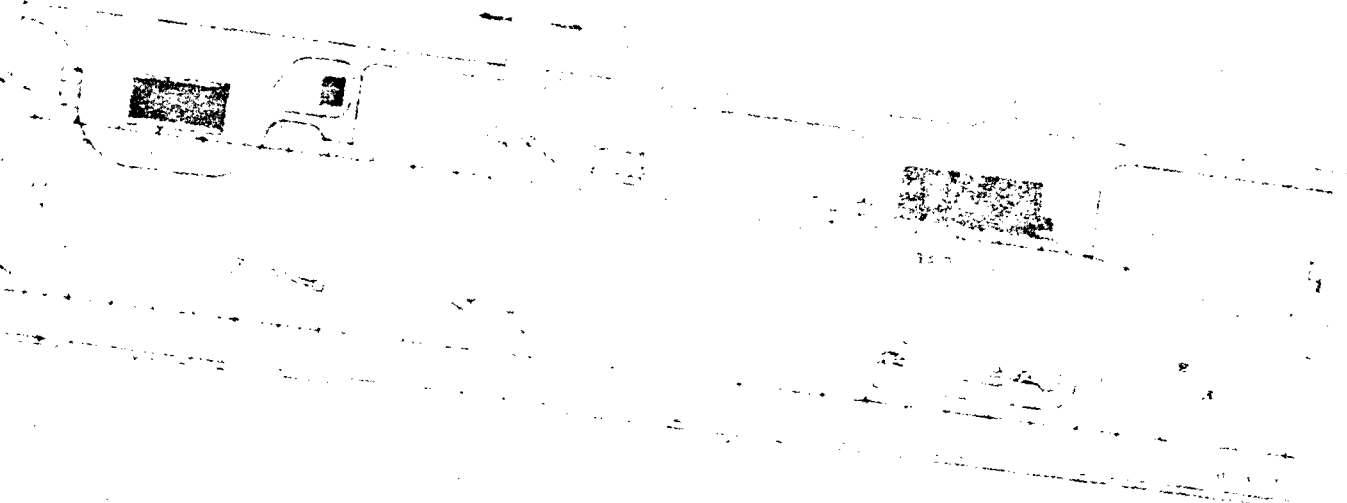
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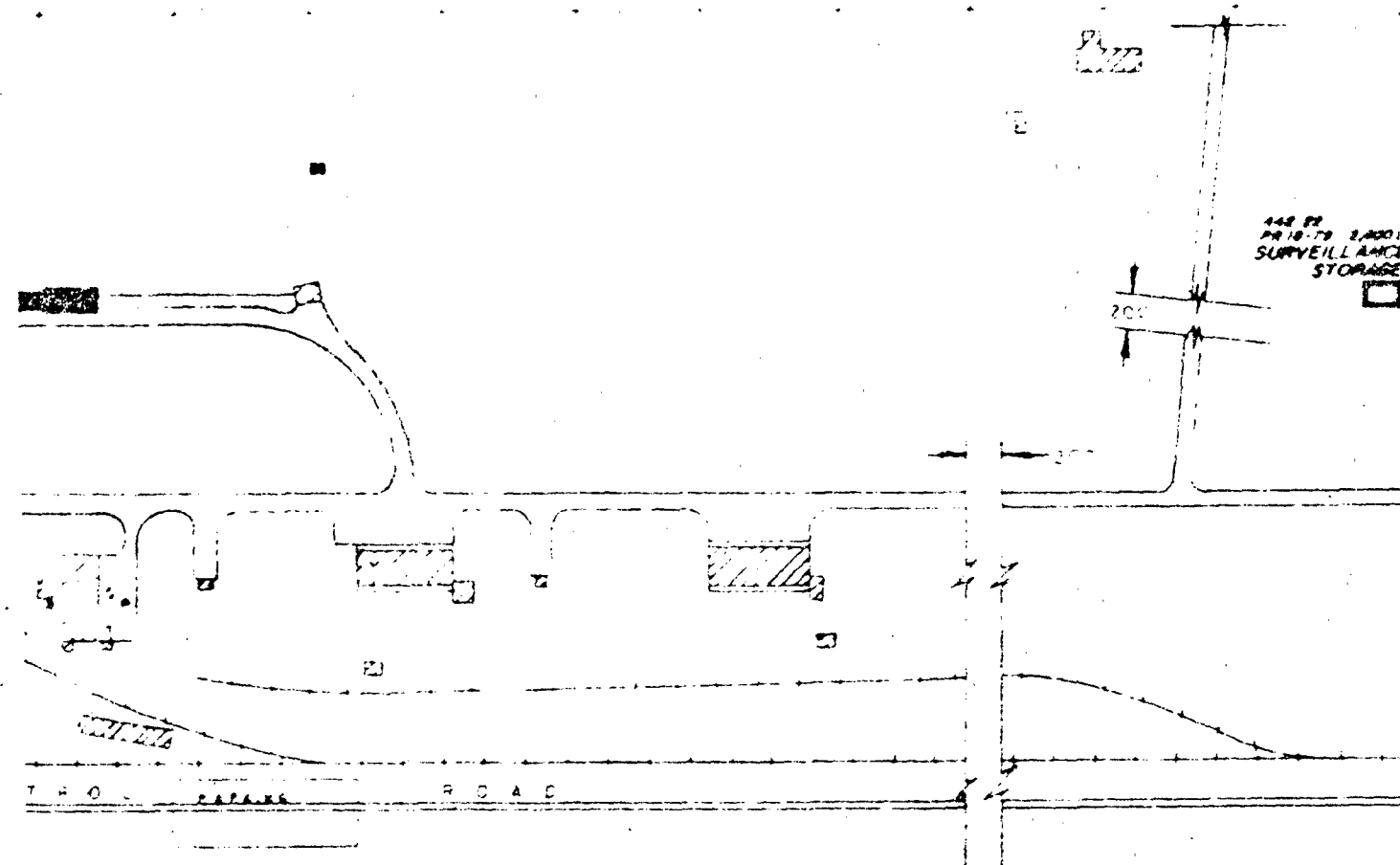
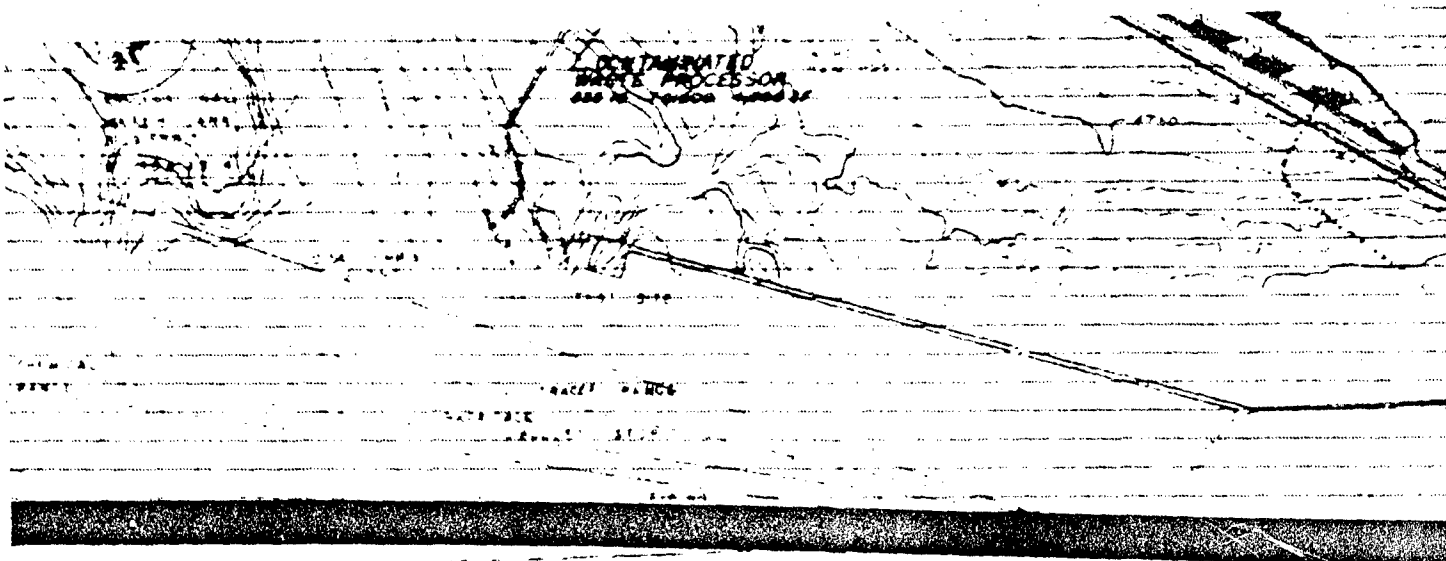
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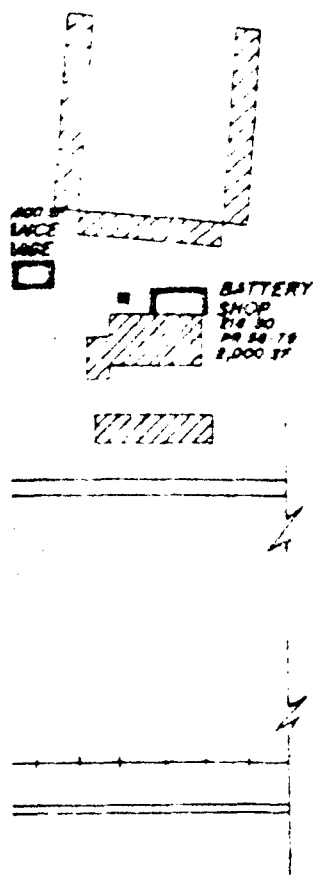
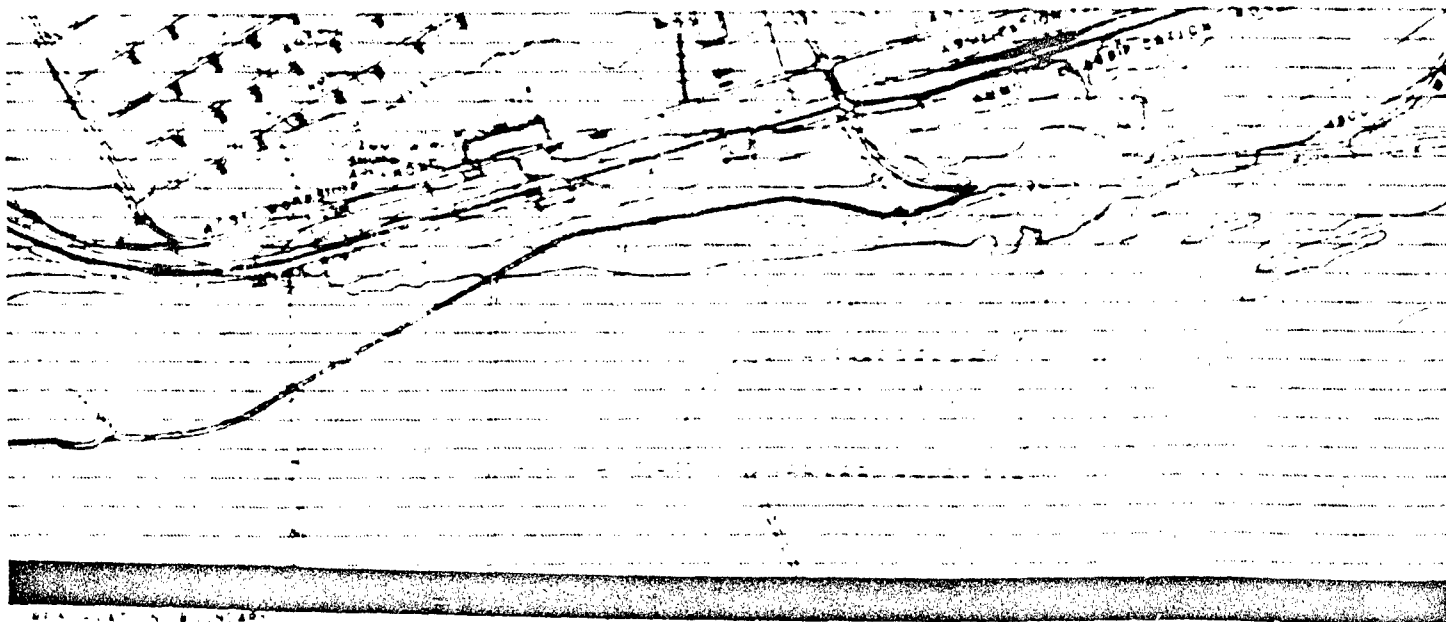
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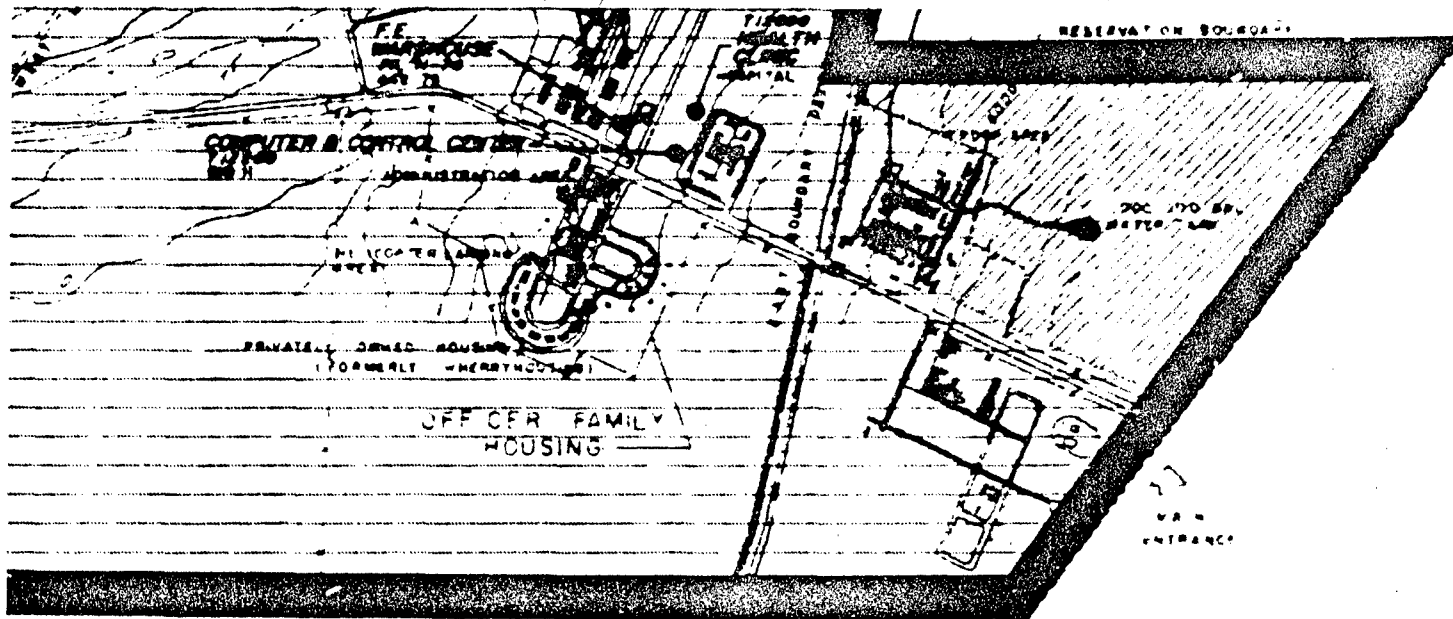
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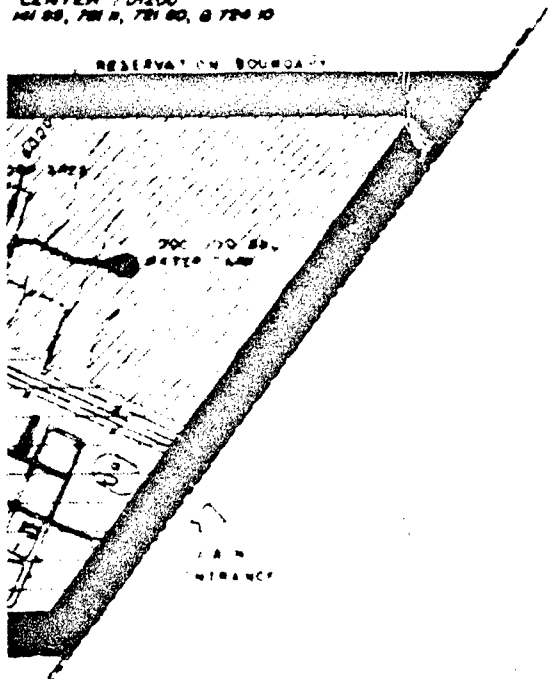
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ROBERT G. MAIR
ARCHITECTS &
COLORADO SPRINGS, CO

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U.S.A.R. TRAMWAY
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NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN.



SCALE IN FEET

CONTOUR INTERVAL 20 FEET

TOOELE ARMY DEPOT

TOOELE, UTAH

ROBERT G. MUR & ASSOCIATES
ARCHITECTS & PLANNERS
COLORADO SPRINGS, COLORADO 80903

U.S. ARMY ENGINEER DISTRICT SACRAMENTO
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA 95834

MASTER PLAN
PLANS FOR FUTURE DEVELOPMENT

GENERAL SITE PLAN

Henry G. Kugenev
ENGINEER

SEP 1982

TOOELE ARMY DEPOT

DATE
SEPT 1982

DRAWING NO
18-04-01

4 OF 28

FILE NO

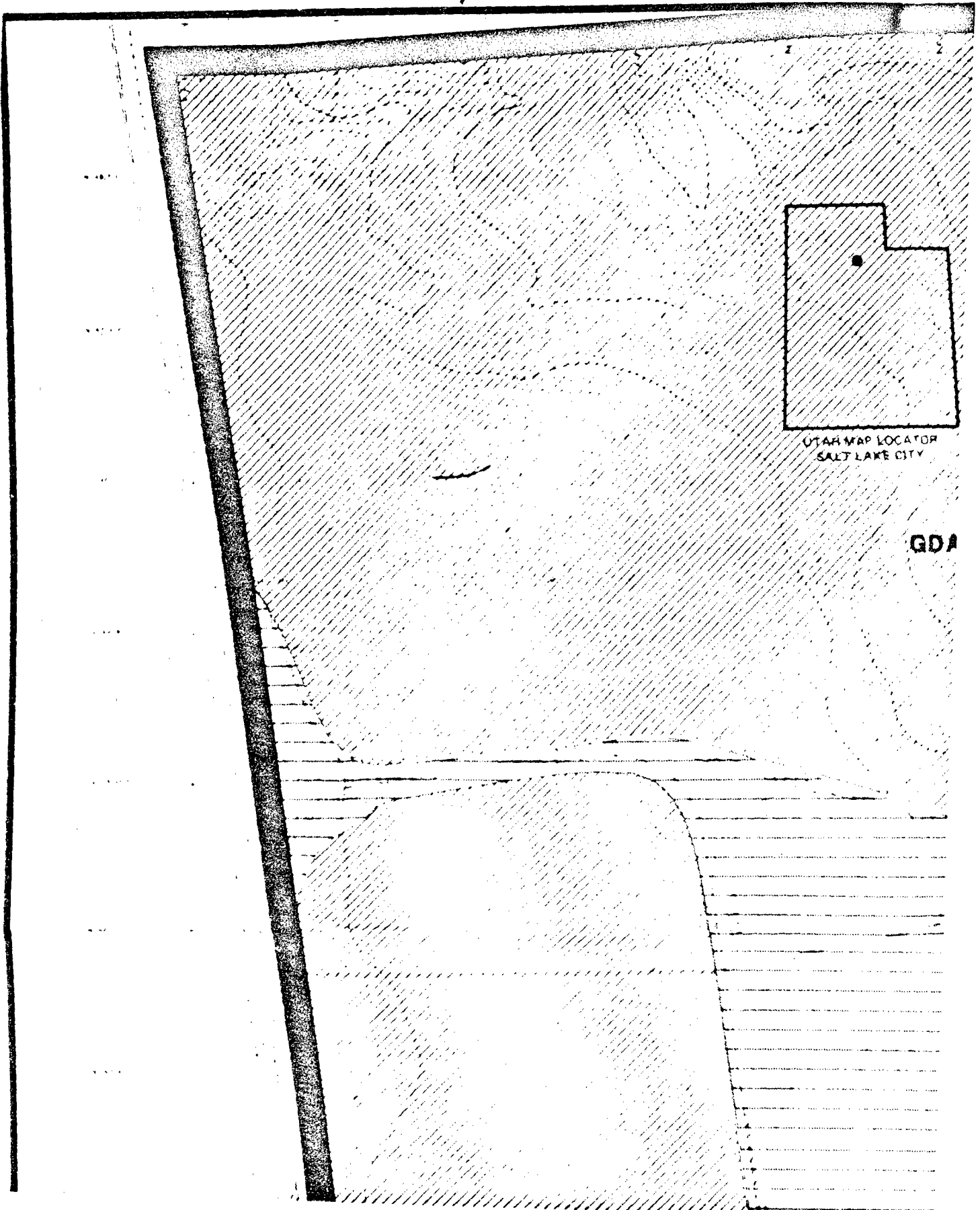
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TOOELE ARMY DEPOT

SOUTH POST

**Figure 3-2 HISTORICAL
AND
PRESENT GROUND DISTURBANCE**

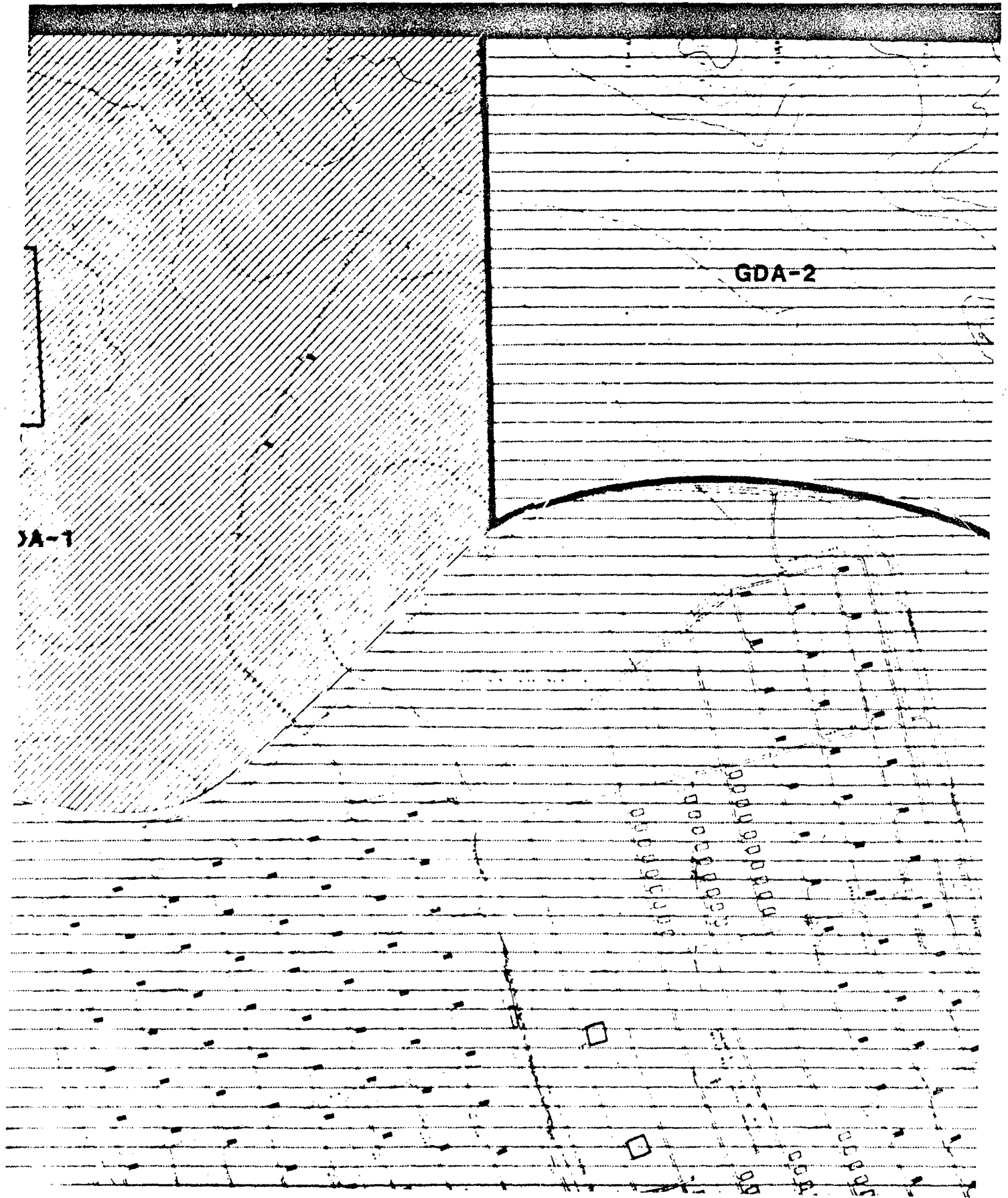
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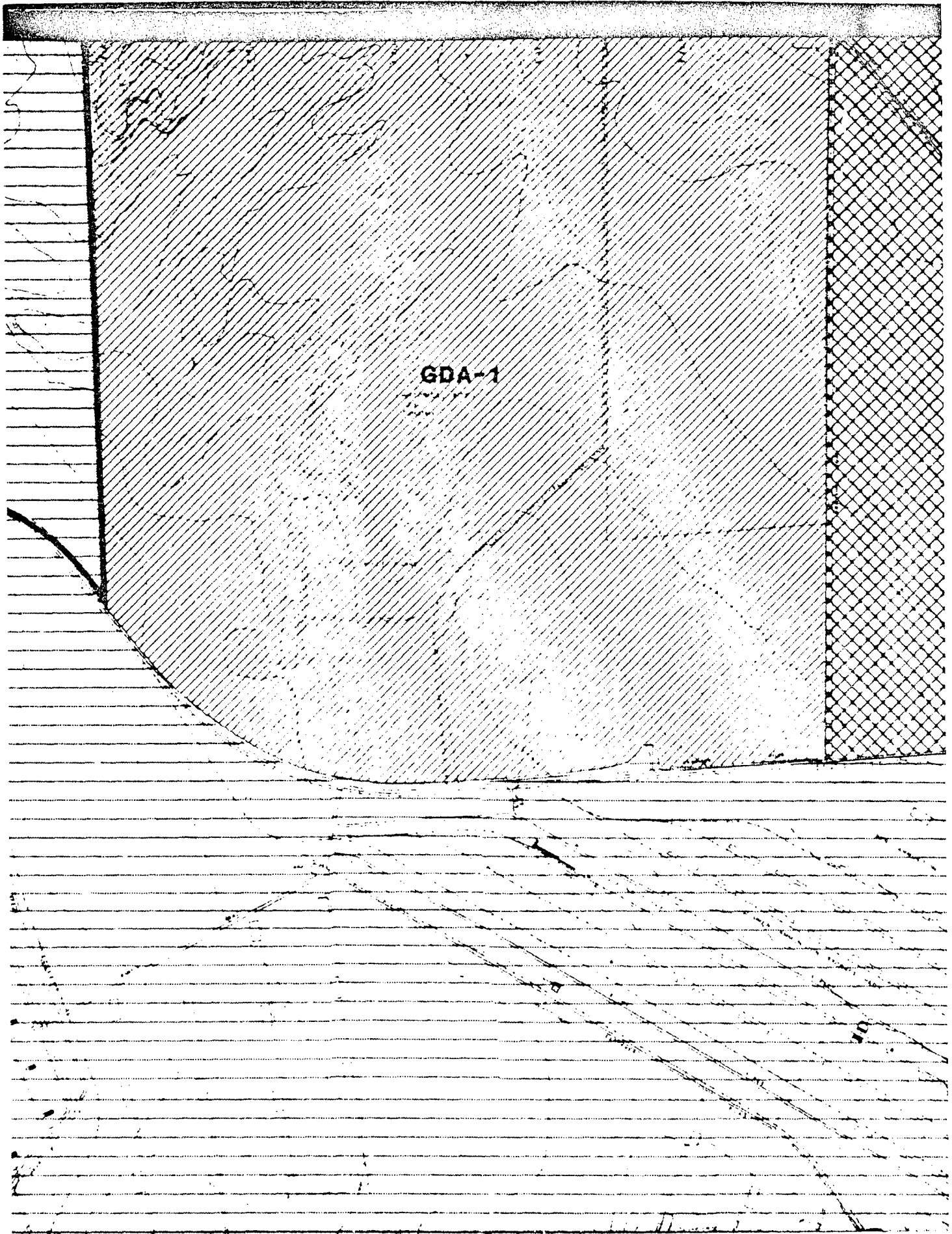


UTAH MAP LOCATOR
SALT LAKE CITY

GDA

2

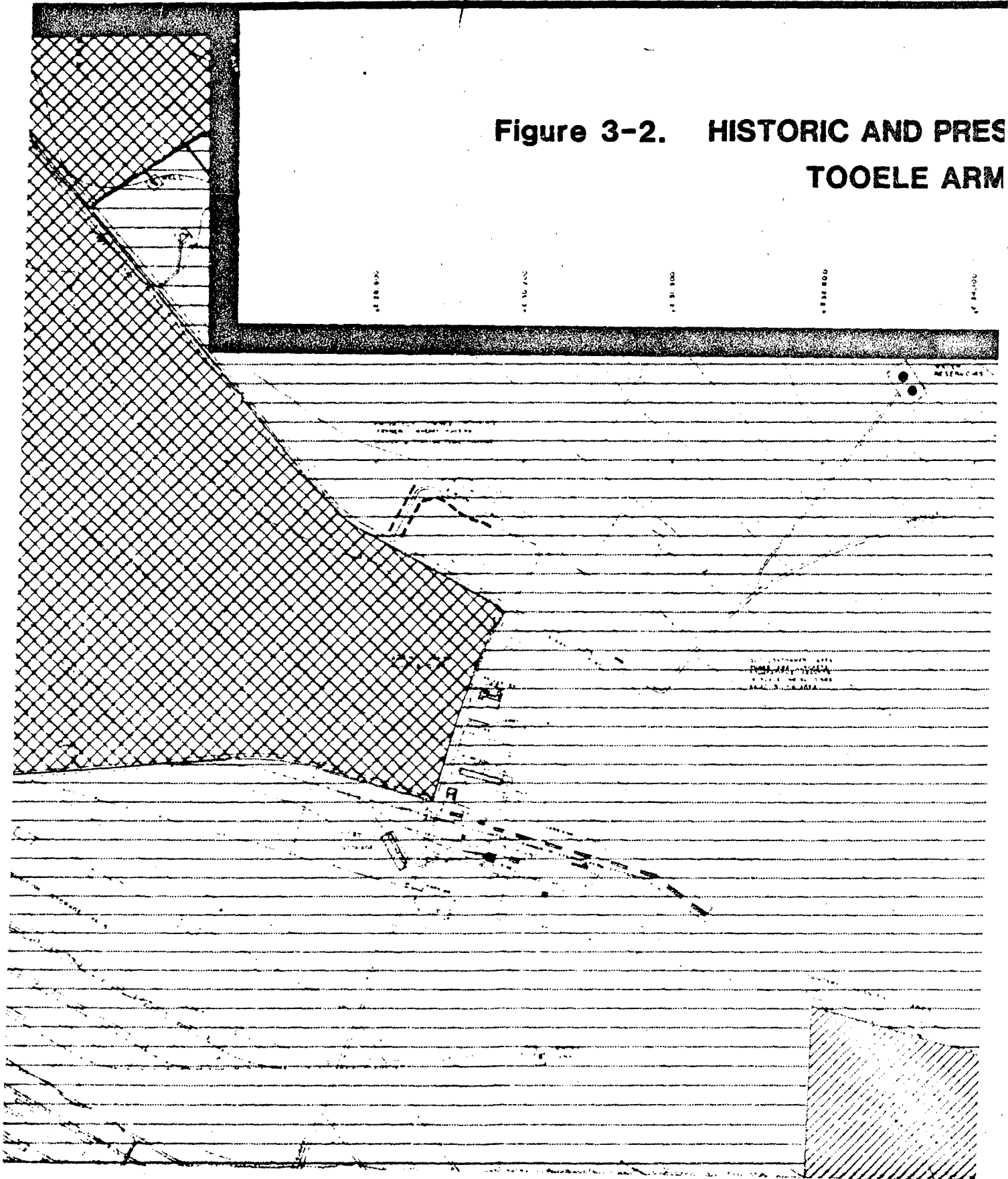




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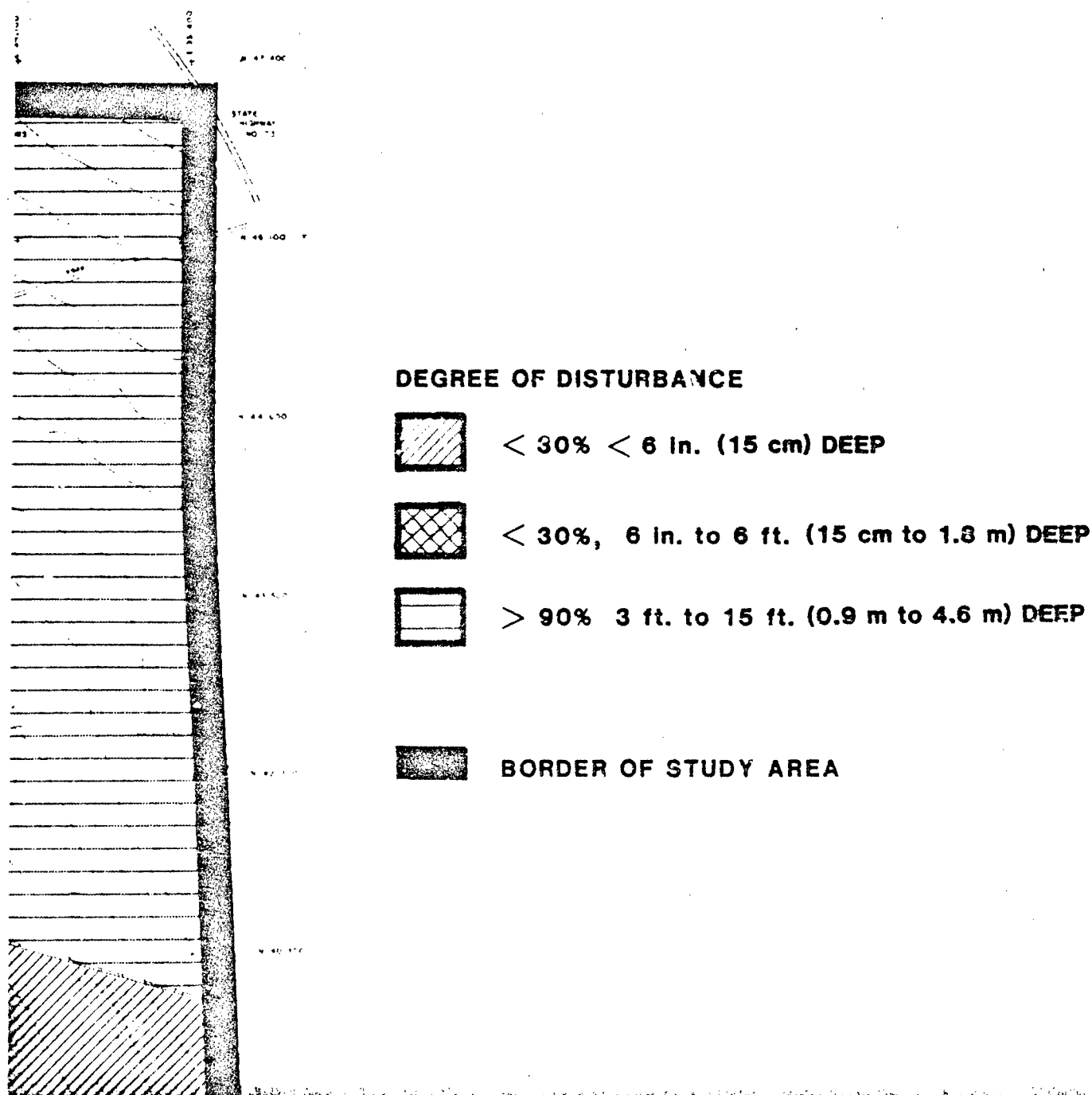
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**Figure 3-2. HISTORIC AND PRES
TOOELE ARM**



ESSENT GROUND DISTURBANCE

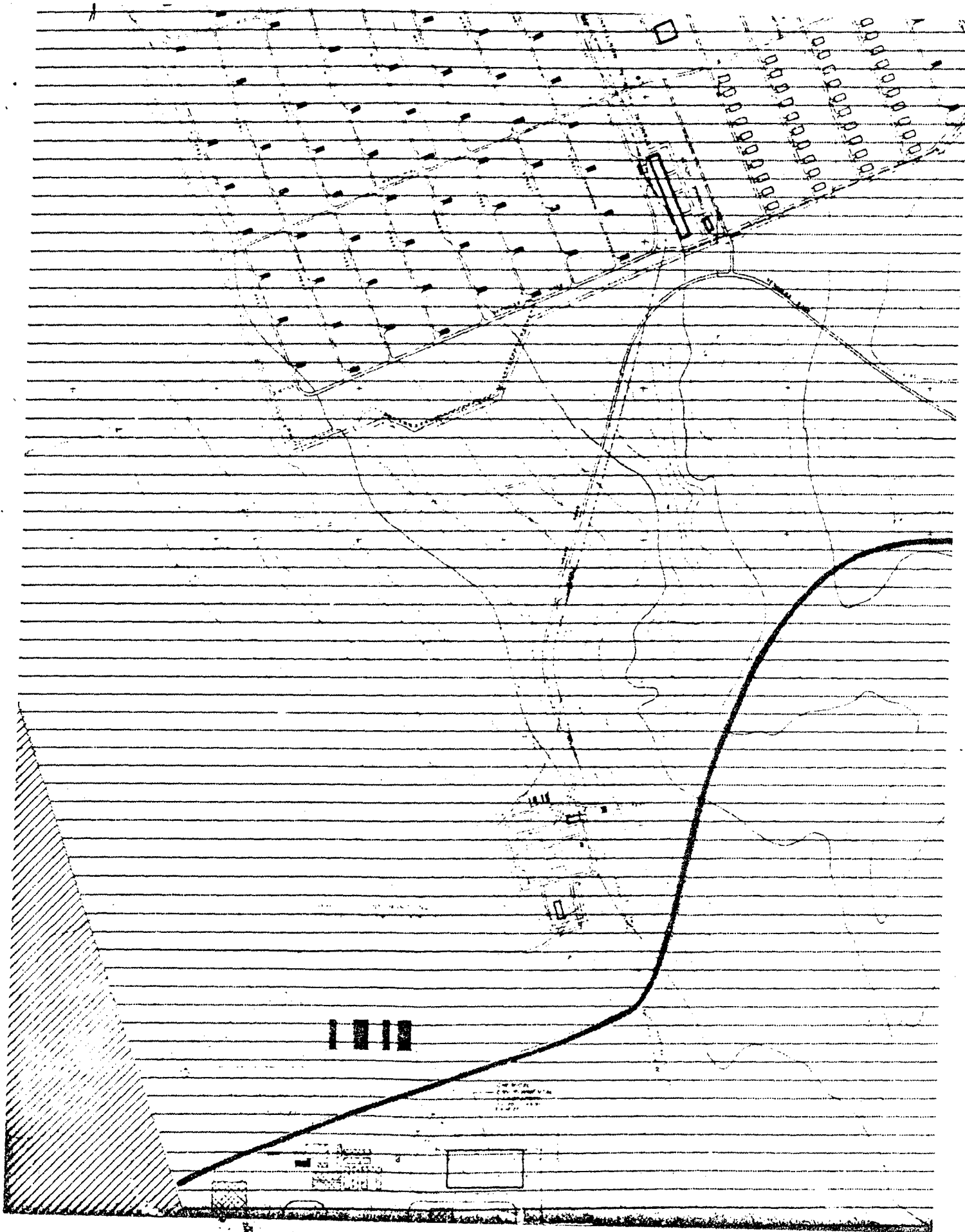
IMY DEPOT - SOUTH POST



5



GDA-1

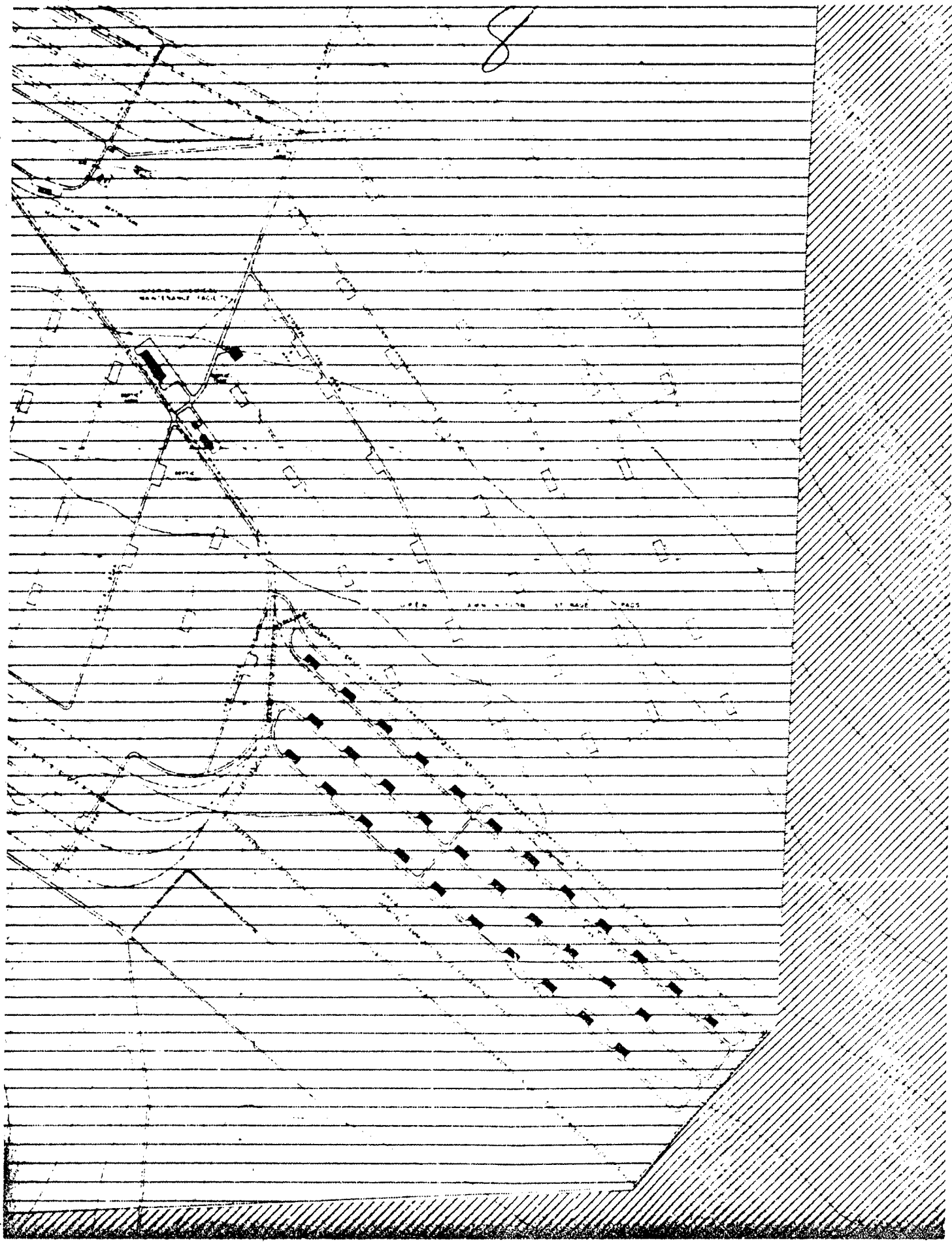




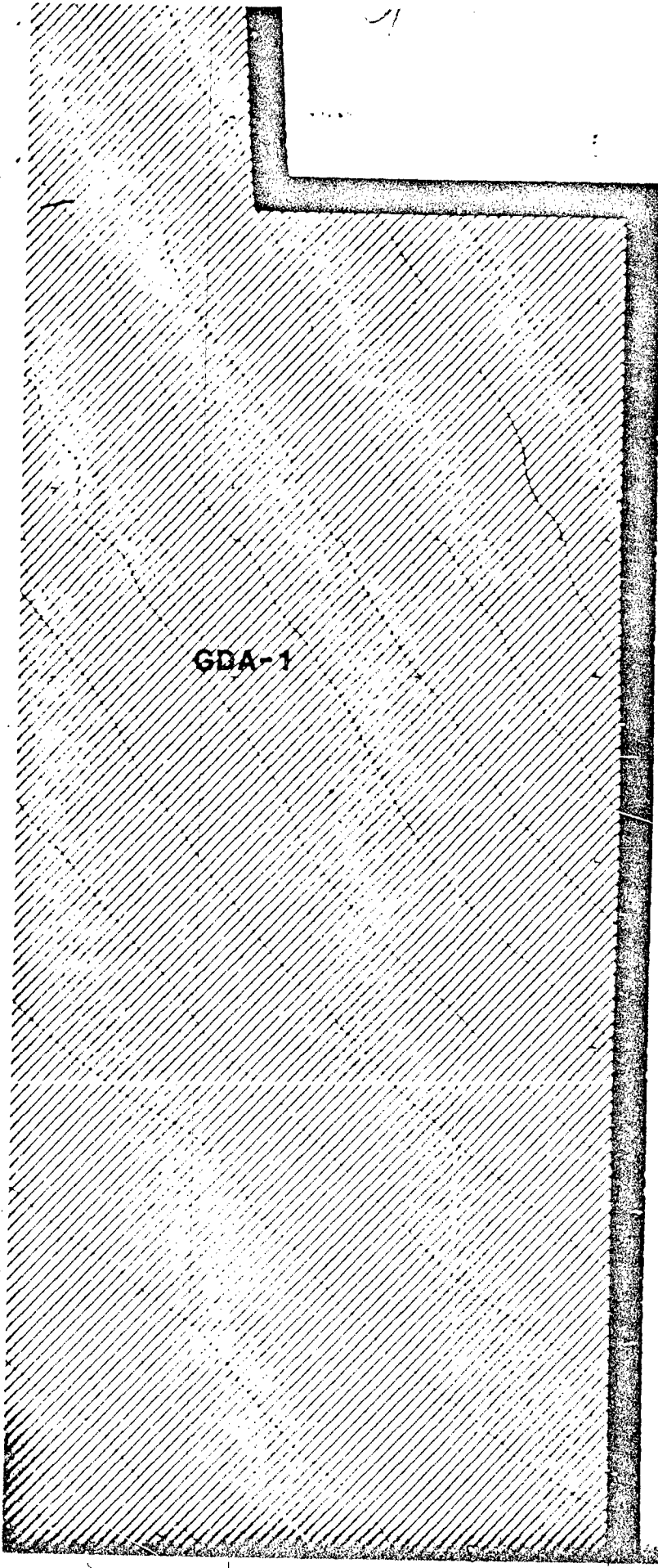
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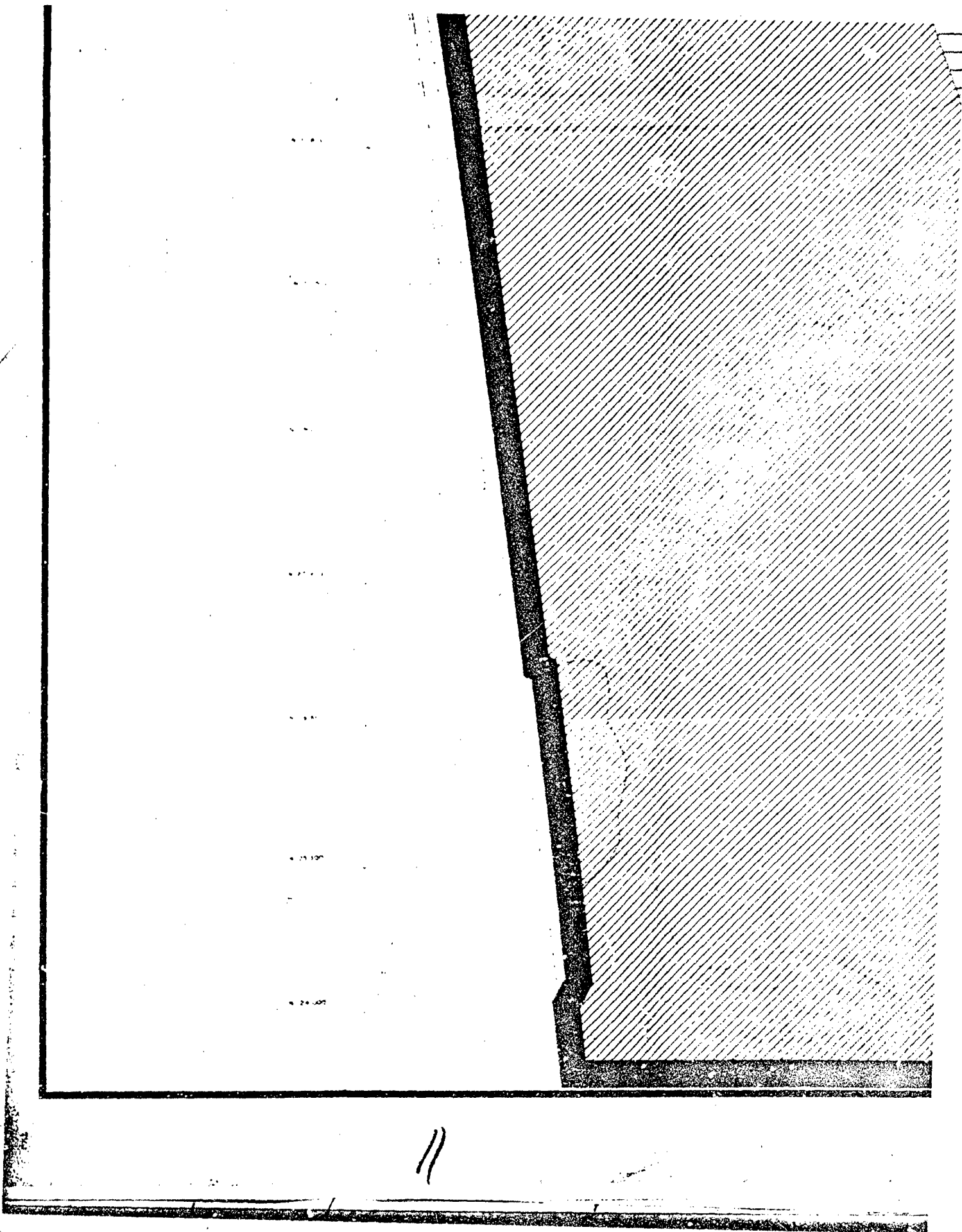
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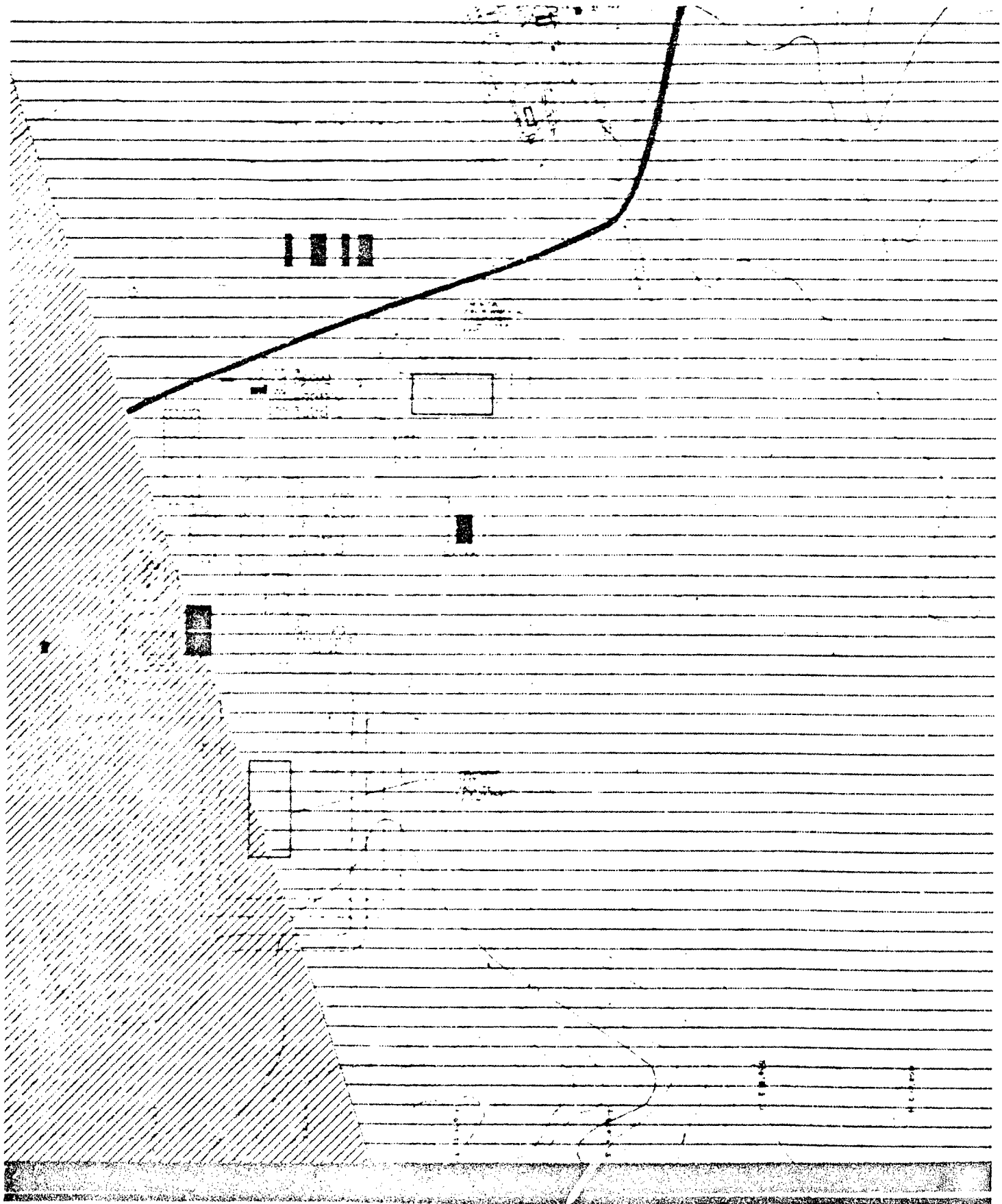
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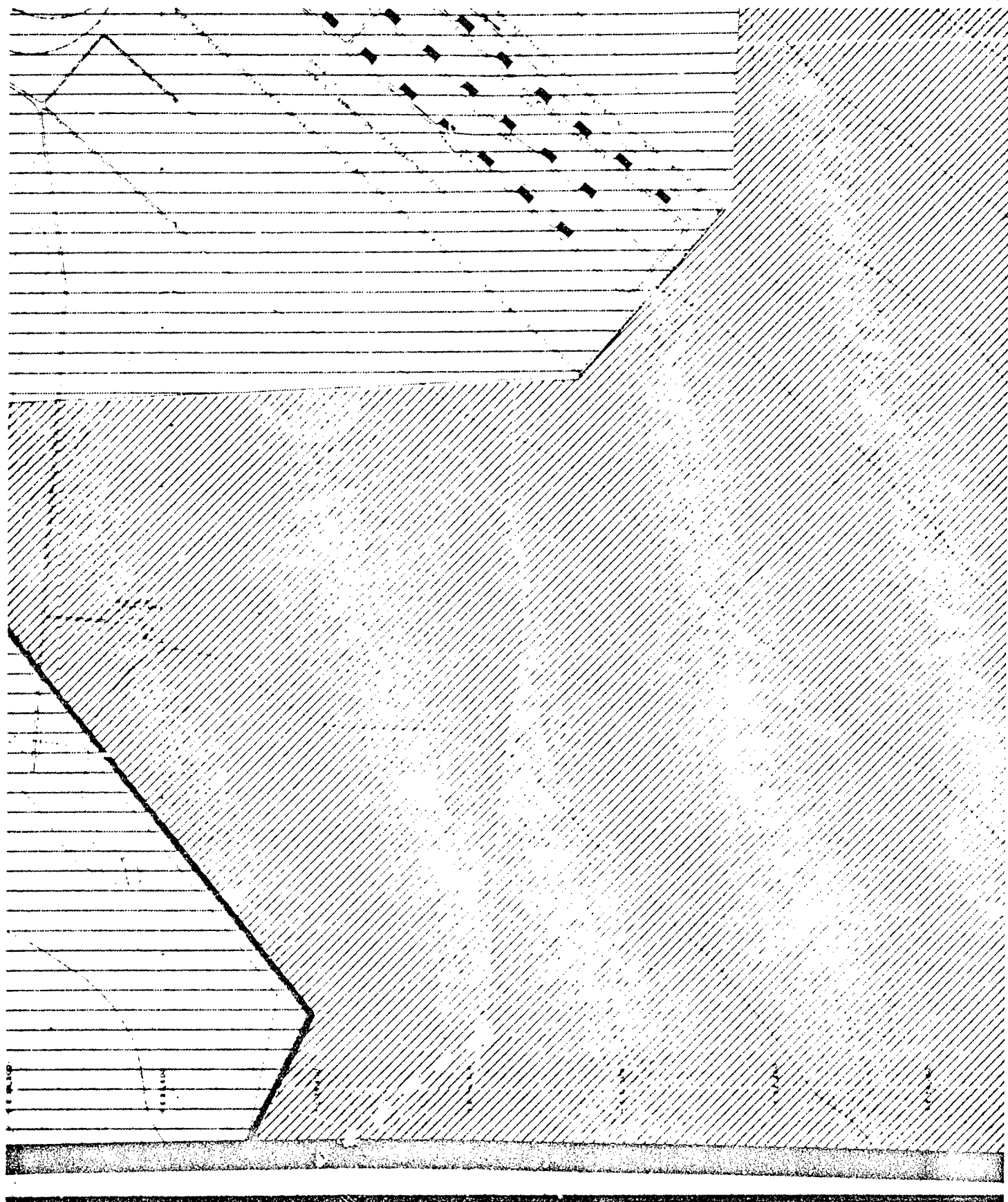
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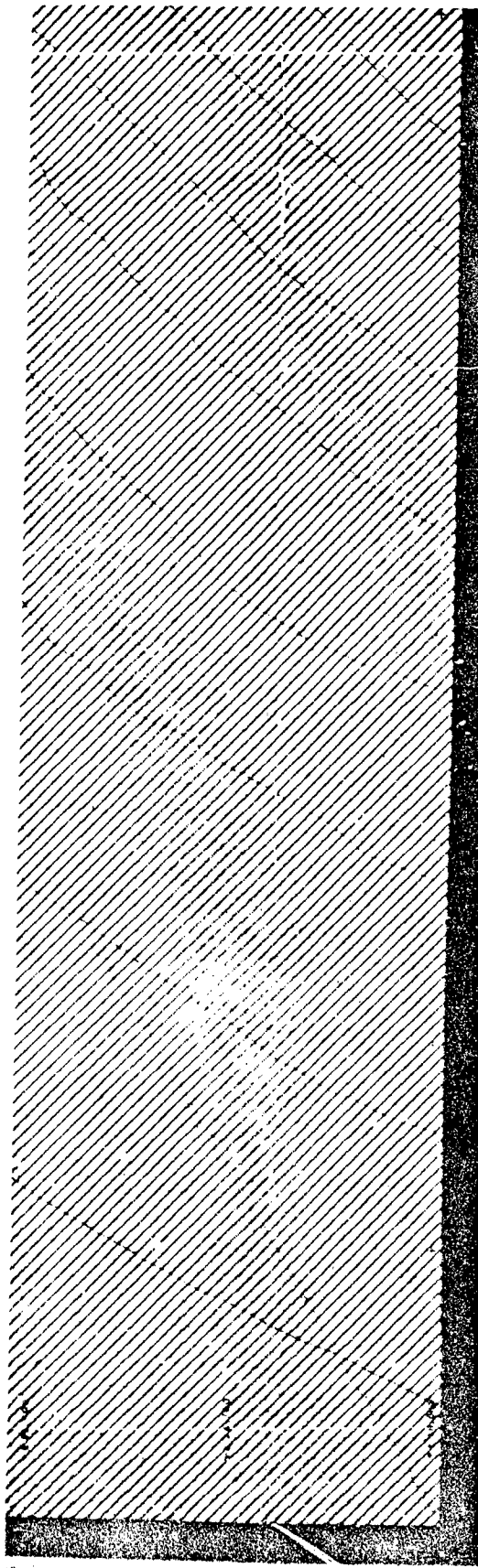




GDA-4



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ROADS & PARKING
RAIL OR EARTH ROAD
WELL ROAD
FENCE
RESERVATION BOUNDARY
WATER STRUCTURES
QUARANTINE IN PLACE
ALLEY CENTER
INTERSECTION OF ALLEYS

N 22 1/4 W

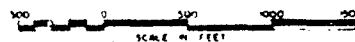
N 22 1/4 W

ON-SITE INSPECTION HAS BEEN COMPLETED FOR ENVIRONMENTAL, HISTORICAL, ECONOMIC, AND OPERATIONAL CONSIDERATIONS FOR EACH PROPOSED ITEM.

Dennis E. Bingham
DENNIS E. BINGHAM
Chief, Depot Facilities Division

NOTE

1. THIS AREA IS NOT LOCATED IN ANY KNOWN FLOOD PLAIN.
2. NO HISTORICAL PLACES NOTED ON THIS SHEET



TOOELE ARMY DEPOT

SOUTH AREA

TOOELE, UTAH

OFFICE OF THE FACILITIES ENGINEER
TOOELE ARMY DEPOT
TOOELE, UTAH

MASTER PLAN

FUTURE DEVELOPMENT PLANS

GENERAL SITE PLAN

AREA 1

Dennis E. Bingham
DENNIS E. BINGHAM, CHIEF, S.D.D.

REVIEWED BY: [Signature]
APPROVED BY: [Signature]

DATE
1960
10-14-60
10-14-60

15

Table 3-1. A SUMMARY OF HISTORIC AND MODERN GROUND DISTURBANCE THAT MIGHT LIMIT THE PRESENT ARCHEOLOGICAL RESOURCE BASE ON THE TOOELE ARMY DEPOT, NORTH POST

GDA No. (a)	Type of Disturbance	Date Conducted (yr)	Reference (b)	Area Disturbed (acres)	Depth Below Surface (ft)	Ratio of Disturbed Total Area	Location of Disturbed Area					USGS Quad Sheet (d)	Coincidental Sites
							UTM (c)		Legal Reference				
							Northing	Easting	Township	Range	Section		
GDA-1	Construction Including Underground and Earth Covered Explosive and Ammunition Bunkers, Base-dations, Base-ments, Gravel pits, Con-trolled Deto-nations and Flood Control Recontouring	1942-Present	Tooele Base History, UHQ Tooele AD Environ-mental As-sessment report (EAR) Personal Com-munications with Base Environmental Specialists	20,932	6 ft to 15 ft	8.5:10	4483100	374300	3S	6W	24,36	1755R	Steward's #9
							4491500	387500	4S	6W	1	SM780	
									4S	4W	6	S780	
									3S	4W	19,30,31	6755	
									4S	5W	1-6		
									3S	5W	13-36		
GDA-2	Small Arms Firings, Construction of Firing Range	1942-Present	Tooele Base History, UHQ Tooele ADEAR Personal Com-munications with Base Specialists	3,480	6 in. to 3 ft.	1:10	4485600	378300	3S	6W	25,26	6755	
							4486100	376100			3S		

Table 3-1. A SUMMARY OF HISTORIC AND MODERN GROUND DISTURBANCE THAT MIGHT LIMIT THE PRESENT ARCHEOLOGICAL RESOURCE BASE ON THE TOOELE ARMY DEPOT, NORTH POST (Continued)

GDA No. (a)	Type of Disturbance	Date Conducted (yr)	Reference (b)	Area Disturbed (acres)	Depth Below Surface (ft)	Ratio of Disturbed Total Area	Location of Disturbed Area					USGS Quad Sheet (d)	Coincidental Sites
							UTM(c)				Legal Reference		
							Northing	Easting	Township	Range			
GDA-3	Sewage Lagoon	Unknown (1942 gravel pit)	Tooele EAR	320	15+ ft	5:10	4488300	384400	3S	5W	24	T755R	
							4488700	384600					

(a) Ground-Disturbance Activities (GDA)
 (b) Utah Historical Quarterly (UHQ)
 (c) Universal Transverse Mercator (UTM)
 Zone 12 TUV

(d) U.S. Geological Survey (USGS)
 T755R - Tooele, UT 7.5 min (1955) Rev. 1969
 SM780 - South Mountain, UT 7.5 min (1980)
 S780 - Stockton, UT 7.5 min (1980)
 G755 - Grantsville, UT 7.5 min (1955)

Table 3-2. A SUMMARY OF HISTORIC AND MODERN GROUND DISTURBANCE THAT MIGHT LIMIT THE PRESENT ARCHEOLOGICAL RESOURCE BASE ON THE TOOELE ARMY DEPOT, SOUTH POST

GDA No. (a)	Type of Disturbance	Date Conducted (yr)	Reference	Area Disturbed (acres)	Depth Below Surface (ft)	Ratio of Disturbed Total Area (b)	Location of Disturbed Area				USGS Quad Sheet (d)	Coincidental Sites	Cemetery
							UTM (c)		Legal Reference				
							Northing	Easting	Township	Range Section			
GDA-1	Graving, Road Building, Gravel Operations	1850-Present	Mercer, 1961 Tooele Army Depot Environmental Assessment Report (EAR)	7,780	Less than 6"	1:10	4457400	3808000	6S	5W	2,3,10,15,22,27	SJ780 0780	
							4465600	284000					
							4464300	385600	6S	5W	1		
							4465400	389000		4W	5,6		
GDA-2	Gravel Removal, Waste Dumping	1942-Present	Tooele Army Depot EAR, Communications With Base Environmental Specialists	520	3 ft to 6 ft	7.5:10	4457400	389000	6S	4W	9,15,16,21,22,27,28	0780	
							4463000	391300	6S				
GDA-3	Construction, Including Buried and Earth Covered Bunkers and Storage Pits	1942-Present	Tooele Army Depot EAR, Site Visit, Communications With Base Environmental Specialists	6,800	3 ft to 15 ft	1:1	4459300	382000	6S	4W	4,5,7,8,9,16,17,18,19,20,21	0780 SJ780	
							4464300	390100					
									6S	5W	1,2,10,11,12,13,14,15,23,24		

Table 3-2. A SUMMARY OF HISTORIC AND MODERN GROUND DISTURBANCE THAT MIGHT LIMIT THE PRESENT ARCHEOLOGICAL RESOURCE BASE ON THE TOOELE ARMY DEPOT, SOUTH POST (Continued)

GDA No. (a)	Type of Disturbance	Date Conducted (yr)	Reference	Area Disturbed (acres)	Depth Below Surface (ft)	Ratio of Disturbed Total Area (b)	Location of Disturbed Area					USGS Quad Sheet (d)	Coincidental Sites
							UTM(c)	Legal Reference			Section		
								Northing	Easting	Township			
GDA-4	Weapons Disposal and Burial, Construction	1942-Present	Tooele Army Depot EAR Communications With Base	4,160	3 ft to 15 ft	?	4457400	382800	6S	4W	19,20,29 30	0780 SJ 780	
							4460600	300500	6S	5W	13,23,24 25,26		

- (a) Ground Disturbance Activities (GDA)
 (b) Both sources indicate that the Army is unsure(?) of the total area disturbed and what has been buried in much of the area, see Management Recommendations.
 (c) Universal Transverse Mercator (UTM)
 Zone 12 UT
 (d) U.S. Geological Survey (USGS)
 SJ780 - St. John, UT 7.5 min (1980)
 0780 - Ophir, UT 7.5 min (1980)

"house-mounds" described by Steward (1933). The actual condition of this site and whether or not it has potential to produce useful data has yet to be determined.

The absence of any Paleo-Indian, Archaic, and Numic materials must also be considered data gaps. In conclusion, there are resources located on the Depot (both North and South Posts), but because of the amount of building that has taken place and because of the absence of systematic surveys, the full extent of prehistoric use of the area is not currently known and may never be known (Tables 3-3 and 3-4).

Identified Archeological Resources

None to date.

Table 3-4. ARCHEOLOGICALLY RELEVANT RESEARCH INVESTIGATIONS, EXCLUSIVE OF ARCHEOLOGICAL SURVEYS, CONDUCTED ON THE TOOELE ARMY DEPOT

Study No.	Study Type	Study Date	Institution, Agency Firm	Principal Investigator	Bibliographic Reference	Location					USGS Quad Map (a)	Associated Archeological Resources
						Northing	UTM		Legal			
							Eastings	Township	Range	Section		
1	Archeological Excavation	1933	University of Utah	J. Steward	Steward 1933	4490520	575720	T3S	R6W	13	G755	Fremont House Mounds No. 3, 4, 5, 6, and 9
						4490580	376300	T3S	R5W	18		
						4487920	375930	T3S	R6W	24		

(a) U.S. Geological Survey (USGS)
G/55 - Grantsville, UT 7.5 min (1955)

SECTION 4

CHAPTER 4.0 KNOWN ARCHEOLOGICAL RESOURCES ON THE TOOELE ARMY DEPOT (NORTH AND SOUTH)

Only two resources are known to exist on the North Post and only one, a family cemetery, exists on the South Post. The two sites located on the North Post are Steward's house mounds 3, 4, 5, 6, and 9 which he excavated in the 1930s, and a large rock whose upper surface is covered with petroglyphs (42T0164). The latter is the only example of rock art known to exist in Tooele County. These sites are summarized in Tables 4-1, 4-2, 4-3, and 4-4.

Table 4-1. PRESENTLY IDENTIFIED ARCHEOLOGICAL RESOURCES ON THE TOOELE ARMY DEPOT: ADMINISTRATIVE DATA

Site Number	Site Recorder	Date of Site Record	Survey Number	SIPO Record Repository	Survey Collection Policy	Current Status of Investigation	NRHP Status (a)	State Local Status	Architectural Association	Bibliographic Reference
Steward's #3, 4, 5, 6, & 9	Steward	1933	-	-	-	-	RAE	-	None	Steward, 1933
42T0164	-	-	-	-	-	-	RAE	-	None	Unknown - Site form is missing

(a) Recommended As Eligible (RAE)

Table 4-2. PRESENTLY IDENTIFIED ARCHEOLOGICAL COMPONENTS ON THE TOOLE ARMY DEPOT: DESCRIPTION AND EVALUATION

Site Number	Unit Age		Unit Description				Evaluation						
	Temporal Unit												
	LM (a)	Years BC/AD	Phase Tradition (Period)	Artifacts (b)	Features Context	Depositional Context	Area (m ²) (c)	Depth	Ascribed Function	Percent Intact (d)	Value Integrity (e)	RV (f)	CR (g)
Steward's #3, 4, 5, 6 & 7	Rel		Premont Sevier	FL BSK HR BI	Pits	Mounds	Flat Plain w/Drawings	N/A	0.3 m	UNK	D, H, SA	4	2
4210104	Rel	Post 500 AD	Freemont/Navaho	-	Petroglyphs	-	Rock Outcrop	18	-	Religious			

- (a) Dating Method (LM) is Relative (Rel.)
 (b) Flaked Lithics (FL), Basketry (BSK), Human Resources (HR), Bone Tools (BT)
 (c) Not Applicable (N/A)
 (d) Unknown (UNK)
 (e) Association (A), Design (D), Workmanship (W)
 (f) Research Value (RV) ranked from 0 (no value) to 5 (highest value)
 (g) Confidence Rating (CR) 1 - not reliable, 2 - moderately reliable, 3 - reliable

Table 4-3. PRESENTLY KNOWN ARTIFACT, ELOFACT, OR DOCUMENTARY COLLECTIONS FOR ARCHEOLOGICAL RESOURCES ON TOOELE ARMY DEPOT

Site Number, Name	Collection Location		Collection Characteristics				Size/No.	Brief Description ^a	Size/No.
	Curatorial Repository	Accession Number(s)	Artifact		Ecofact				
			Brief Description	Size/No.	Brief Description	Size/No.			
Not known at present.	Utah State Historical Society	B-57						WPA Pioneer Personal History Interviews (Questions 65-73)	136 linear feet of documents

Table 4-4. POTENTIALLY IDENTIFIABLE BUT NOT PRESENTLY RECORDED ARCHEOLOGICAL RESOURCES ON TOOELE ARMY DEPOT

<u>Site Number, Name</u>	<u>Reference</u>	<u>Description</u>	<u>Research Value CR</u>
None Are Presently Known			

SECTION 5

CHAPTER 5.0 AN ASSESSMENT OF THE SIGNIFICANCE OF THE ARCHEOLOGICAL RESOURCE BASE TOOELE ARMY DEPOT

The descriptive data already presented are synthesized in this section in order to provide the cultural resources planner with an understanding of the significance and values needed to make sound judgements.

In order to clarify the assessment of significance of archeological sites, Schiffer and Gumerman (1977) have isolated five different kinds of significance that pertain to the archeological record. These are: 1) legal, 2) ethnic, 3) public, 4) historic, and 5) scientific significance.

Legal Significance. Legal significance, as a national policy, is based on the passage and enactment of the Antiquities Act of 1906, the Historic Sites Act of 1935, and the National Historic Preservation Act (NHPA) of 1966, as amended.

The latter two established the responsibility for maintaining a National Register of Historic Places (NRHP). For a site or property to be eligible for the NRHP, it must meet certain criteria, including:

It must be at least 50 years old, and the quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

- A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. That are associated with lives of persons significant in our past; or
- C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. That have yielded or may be likely to yield, information important in prehistory or history.

Ethnic Significance. Ethnically significant sites are those sites (Moratto 1975) having either religious, mythological, or other special importance for a specific population. Such a determination depends on the views and values of the specific population in question.

Public Significance. Public significance centers on the value of archeological research to the public. Moratto (1975) defines public significance in terms of the educational value of a site, the use of research findings for enrichment or for practical industrial applications, and the use of material cultural remains for exhibits or public enjoyment and for the enhancement of public appreciation for local history and prehistory.

Historical Significance. Cultural resources, must have "the potential for the identification and reconstruction of specific cultures, periods, lifeways, and events, or provide a typical or well-preserved example of a culture, historical tribe, period of time, or category of human activity," or "be associated with a specific event or aspect of history" (Scovill et al. 1972:56) to be historically significant.

Scientific Significance. Scientific significance deals with a given site's ability to produce useful data capable of solving archeological problems. There are inherent problems in determining scientific significance including changing research direction through time and the development of new methods and techniques. Consequently, the site that today is considered insignificant may tomorrow be of critical importance.

The types of significance discussed above, contain levels of significance. These are local, state, regional, and national significance.

5.1 THE SIGNIFICANT RESOURCE BASE

As archeologists classify data to facilitate analysis, cultural resource values must also be classified in order to facilitate sound management. Table 5-1 represents just such an attempt at classification. In this table the cultural resources, both actual and potential, are presented by culture period and thematic units. Inspection of the table will quickly reveal that the amounts of known resources is very small. This may be due to a number of factors, including: 1) the lack of cultural resource surveys in the study area due to the installation's mission; 2) the heavy impact of massive wind erosion of the 1930's (the Grantsville Dust Bowl); 3) the comparatively small size of the installation vis a vis the amount of surface disturbance present due to the installation's mission; 4) the fact that the study area is an area of sediment deposition; and 5) the despoilation of the study area by collectors prior to the U.S. Army's taking control of the area.

Highest research values were given to three main temporal units: the Pre-Clovis Period, the Early Archaic Period, and the Fremont Period (Formative Stage). As far as the Pre-Clovis and Early Archaic Periods are concerned, any sites that contain information or data bearing on the problem of the early settlement of the New World (Pre-Clovis), and any site that contains data on the very early Desert Cultural Adaptatives (Early Archaic) are particularly important to our understanding of the patterns of early adaptations by human groups to a desert way of life.

In terms of the Fremont period, particular attention must be paid to Julian Steward's House Mounds 3, 4, 5, 6, and 9. Fremont house mound sites are rare and they have the potential to provide critical data on subsistence practices and social organization. At present, the condition of the site and its potential to provide useful data are unknown. An evaluative program for this site is included in the Management Plan (Chapter 6).

Table 5-1. SUMMARY OF SIGNIFICANT ARCHEOLOGICAL RESOURCES ON THE TODELE ARMY DEPOT

Temporal Unit	Thematic Unit	Resource Type	Type Occurrence			Sociocultural Association	Landform Association	Physical Integrity	Research Value		Socio-Cultural Value	
			Known Occurrences (No.)	Potential Occurrences (No.)	Other Likely Occurrences (a)				(b)	(c)	(d)	(e)
Historic Period	Ranching/farming	Homesteads/outbuildings cemetery	1	0	+	EuroAmerican	Open plain	Fair	3	2	2	2
Ethno-historic	Seasonal hunting/gathering	Rock Art/campsites	1(?)	0	+	Native American	Terraces open plains N/H ₂ O	Fair	3	3	3	2
Post Formative Period (Runic speakers)	Seasonal hunting/gathering	Rock Art/campsites	1(?)	0	+	Native American	Terraces open plains N/H ₂ O	Fair	4	3	3	2
Formative stage Fremont (Sevier)	Horti-cultural	Village burials	1	0	++	Native American	Floodplains and alluvial	Fair to good	5	3	4	2
Late Archaic	Seasonal hunting/gathering	Campsite	0	0	+	Native American	Terraces/springs	Fair	4	3	3	2
Middle Archaic	Seasonal hunting/gathering	Campsite	0	0	+	Native American	Terraces/springs	Fair	4	3	3	2
Early Archaic	Seasonal hunting/gathering	Campsite	0	0	+	Native American	Terraces/springs	Fair	5	3	3	2
Plano	Big game hunting	Kill and butchering site	0	0	+	Native American	Arroyos/dunes	Fair to poor	4	3	3	2

Table 5-1. SUMMARY OF SIGNIFICANT ARCHEOLOGICAL RESOURCES ON THE TOOELE ARMY DEPOT (Continued)

Temporal Unit	Thematic Unit	Resource Type	Type Occurrence			Sociocultural Association	Landform	Physical Integrity	Research Value		RV CR	Socio-Cultural Value		SCV CR
			Known Occurrences (No.)	Potential Occurrences (No.)	Other Likely Occurrences (a)				(b)	(c)		(d)	(e)	
Folsom	Big game hunting	Kill and butchering site	0	0	+	Native American	Arroyos/dunes	Fair to poor	4	3	3	3	2	2
Clovis	Big game hunting	Kill and butchering site	0	0	+	Native American	Dunes/basins/springs	Fair to poor	4	3	3	3	2	2
Pre-Clovis	Big game hunting	Kill and butchering site	0	0	+	Native American	Basins/springs	Fair	5	3	3	3	2	2

- (a) The number of presently known or potential archeological resources of this type is specified here. In addition a judgement has been made as to the likelihood that other members of this resource occur within the facility, based on an analysis of the ethnohistoric or historic land use patterns and/or a review of the landform patterning of prehistoric materials. The probability of these additional occurrences has been noted as negative (-), positive (+), or highly positive (++).
- (b) This is a subjective summary assessment of the overall research value (RV) of the resource class. It is an evaluation of the class' quality of preservation, representation of activity diversity or uniqueness, and temporal distinctiveness or reflection of diachronic relationships. It incorporates the need to avoid triviality, but to acquire what may be redundant data so as to discern patterns among those data. Based on these research values, the resource classes under discussion are ranked from 0 (no value) to 5 (highest value), including "NA" if such an evaluation is believed to be impossible given the available information.
- (c) The Confidence Rating (CR) is a further evaluation of the perceived reliability of the research (RV) or sociocultural (SCV) values of the resource class. 1 = the judgement is more guess than science, and likely not to be reliable; 2 = the judgement is moderately reliable; 3 = the judgement is most likely reliable.
- (d) This is a subjective summary assessment of the overall sociocultural value (SCV) of the resource class. It is an evaluation of the social, religious, or political importance of the resource to a contemporary community, from 0 (no value) to 5 (highest value).
- (?) Rock Art site on Tooele Army Depot (North Post) may be either prehistoric or Ethnohistoric.

5.2 IDEAL GOALS AND OBJECTIVES

An ideal cultural resource management program would consist of 1) identification of resources, 2) evaluation of these resource as to their significance and potential to provide useful scientific data, and 3) an active program of conservation of these resources.

Identification would be accomplished through a two-phase program. Phase I would consist of a literature review to identify any known archeological and historic properties located on the Depot.

Phase II of the identification program would consist of a field survey of the undisturbed portions of the depot in order to locate and identify surface evidence of prehistoric and/or historic sites. This survey program would include a close-interval pedestrian survey supplemented by detailed topographic maps and aerial photography. Standard forms as specified by the Utah State Archaeologist plus any needed supplementary forms should be completed for any prehistoric or historic materials found. Artifacts collected during the course of the survey should be kept to a bare minimum and all materials removed from the site should be fully documented and appropriately curated. In some instances it may be necessary to include subsurface investigations (e.g., augering, test excavation, remote sensing) in order to determine site content, extent, and significance. It is during this phase of the identification program that important research values as well as other values will be identified to serve as a basis for the development of future research designs and to serve as the basis for a variety of management options.

All sites located during the survey should be evaluated, in consultation with the State Historic Preservation Office (SHPO) for the State of Utah, regarding eligibility for nomination to the NRHP. In accordance with Section 106 of the Historic Preservation Act, any plans to modify or disturb a site 1) determined to be eligible for nomination to, 2) pending nomination to, or 3) listed on the NRHP, will have to be submitted to the Advisory Council on Historic Preservation (ACHP) for comment.

Active conservation as an ideal concept embodies the idea that archeological resources are a non-renewable resource and that once they are destroyed they can never be recovered. Consequently, it is critical that the cultural resource manager be able to exercise his management options in a nonreactive manner (i.e., being represented when decisions are made which may influence cultural resources). In other words, the greater the input of the cultural resource manager into the planning process, the better the management decisions.

Full scale excavation and analysis of any resource is a course of action that should only be taken where the resource is threatened with unavoidable destruction or damage (Figure 5-1 and 5-2). On the other hand, excavation and analysis should take place if site destruction is inevitable. It is important to the data recovery and the mitigation process that the archeologist be placed in a non-reactive situation (e.g., the site being threatened with immediate destruction). Again, the greater the lead time the archeologist has, the greater and more efficient the data recovery process will be.

TOOELE ARMY DEPOT

NORTH POST

**Figure 5-1 KNOWN, POTENTIAL
AND
SURVEYED ARCHEOLOGICAL SITES**

48800 W
15600 N+

45500 W

44200 W

42900 W

40600 W

39300 W

38000 W

36700 W

35400 W

14300 N+

13000 N+

11700 N+

04700 N+

STEWARDS #7 PIT HOUSE EXCAVATED

3 PIT HOUSE EXCAVATED

KEY MAP

045-123

01400 N+

00100 N+

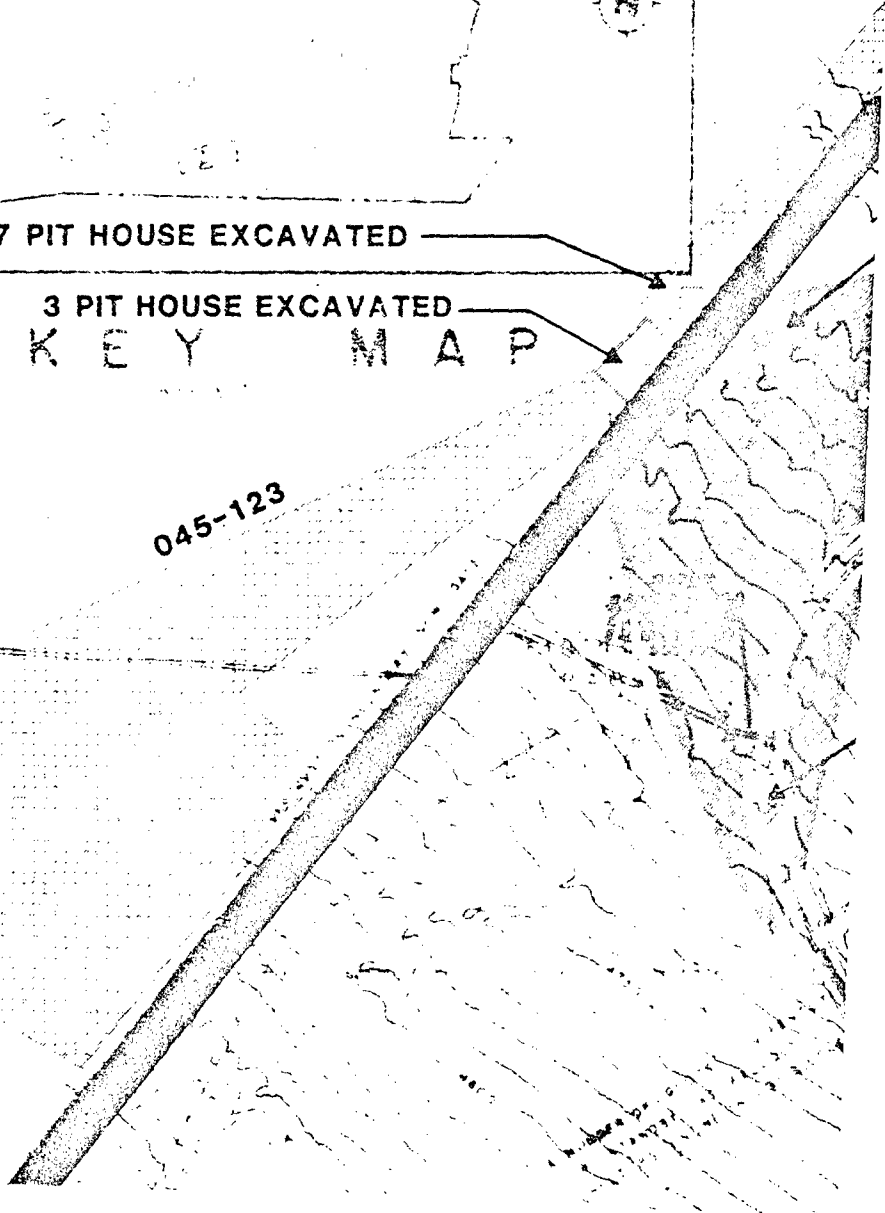
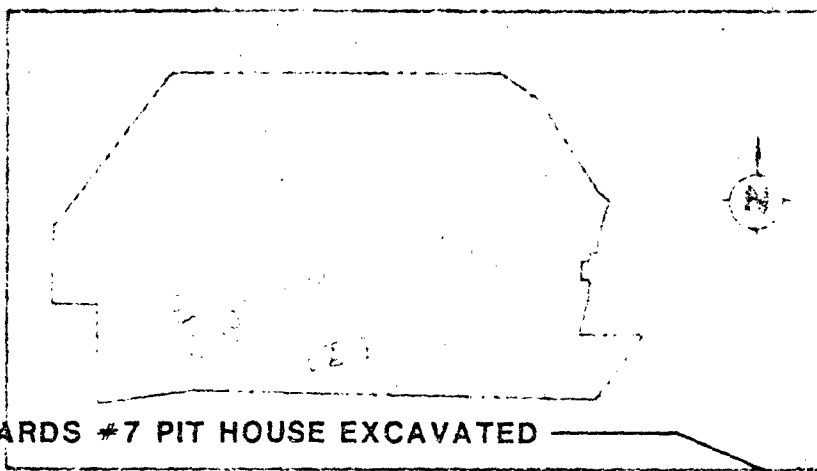
65200 W

63900 W

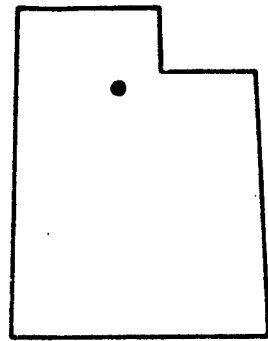
62600 W

2600 N+

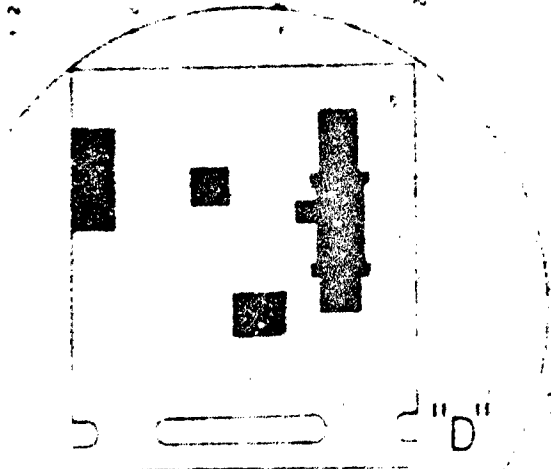
1300 N+



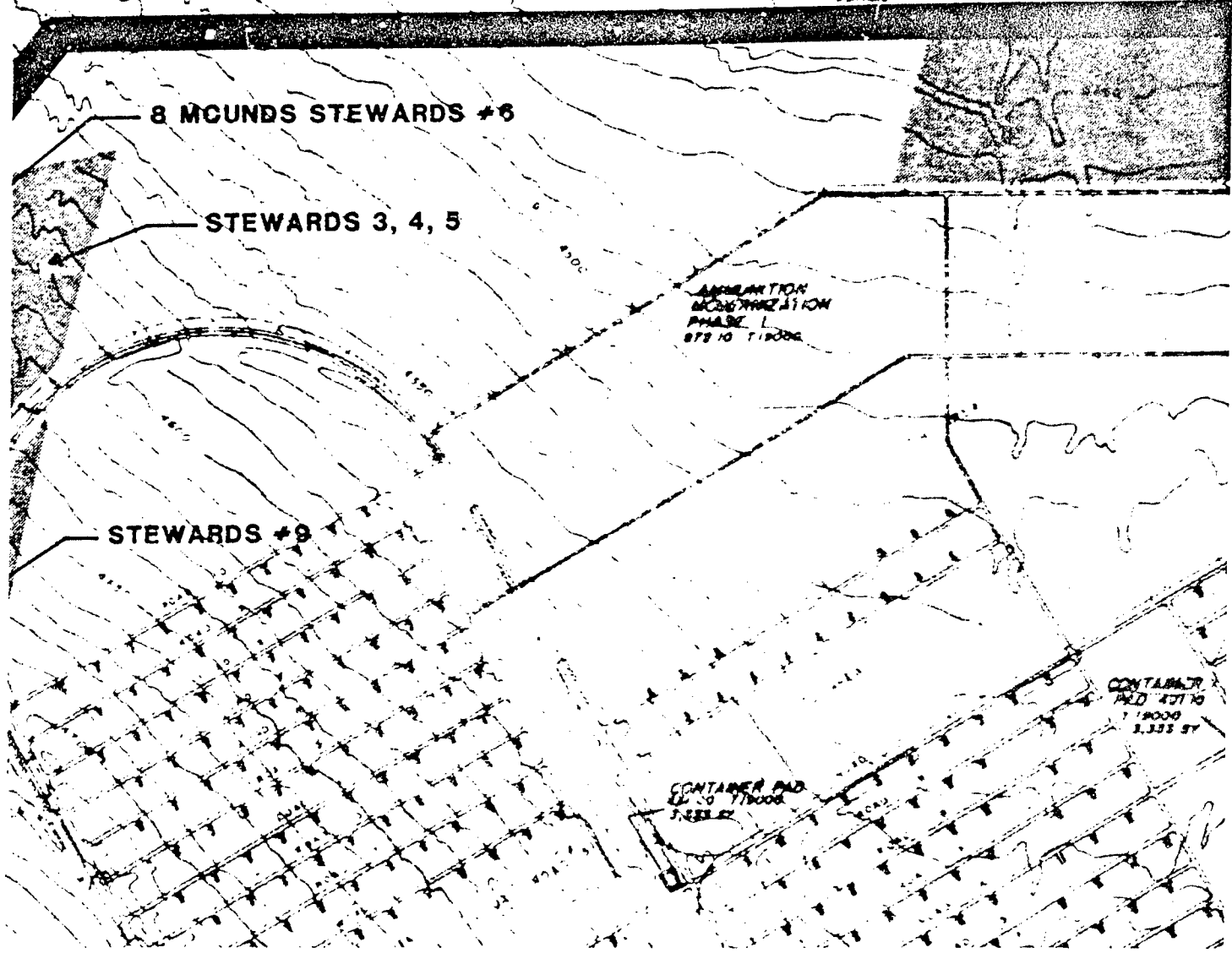
36400 W
35000 W
33800 W
32500 W
31200 W
29900 W
28600 W
27300 W
26000 W
24700 W



UTAH MAP LOCATOR
SALT LAKE CITY



AED FURNACE SITE
SCALE 1" = 165'



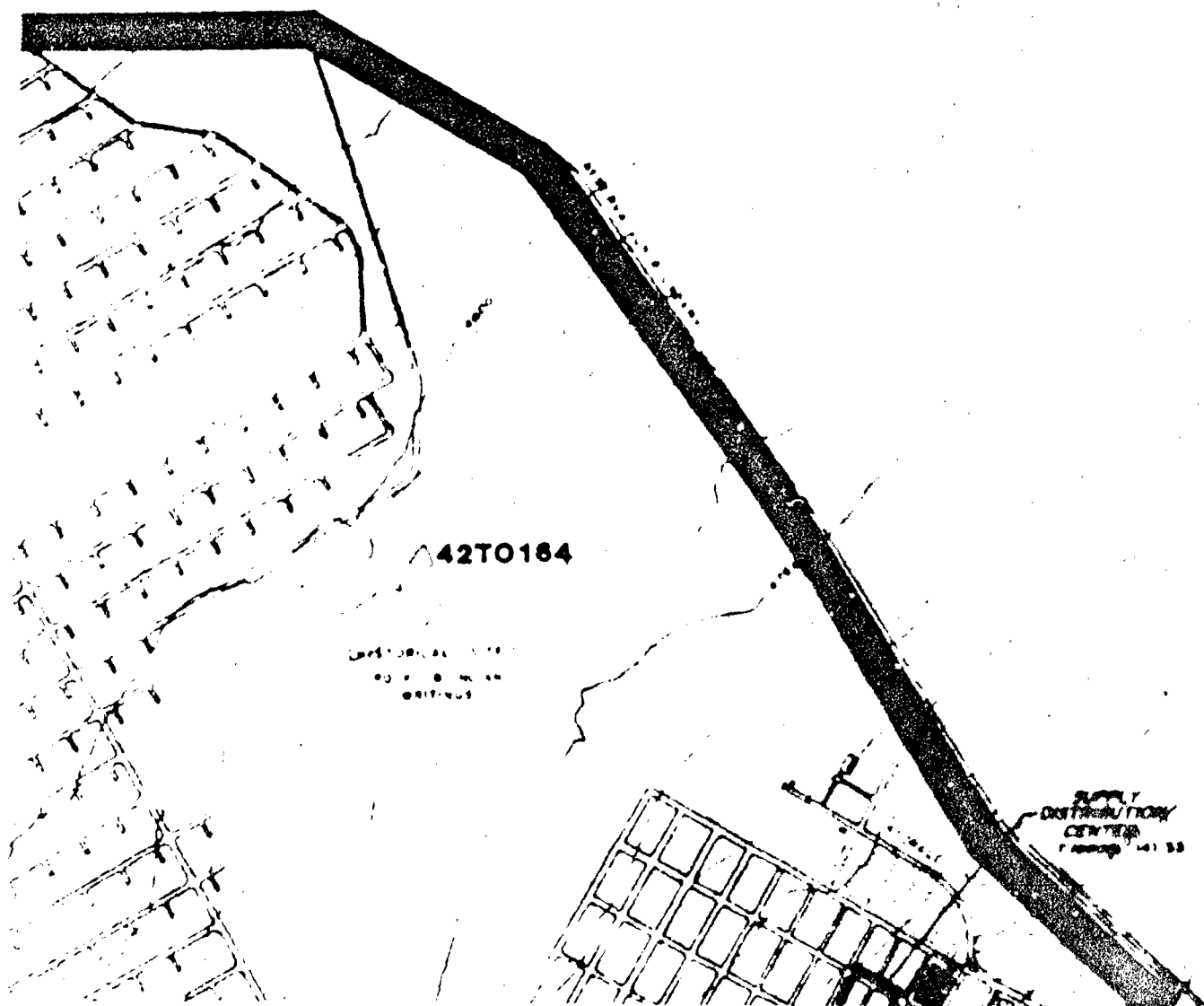
3



4

11,000 ft
10,000 ft
9,000 ft
8,000 ft
7,000 ft
6,000 ft
5,000 ft
4,000 ft
3,000 ft
2,000 ft
1,000 ft
LEVEE DIAM

**Figure 5-1. KNOWN, POTENTIAL AND SUBSISTENCE
TOOELE ARMY DE**



5

LEGEND

ALL AND SURVEYED ARCHEOLOGICAL SITES AT ARMY DEPOT - NORTH POST



AREAS OF POTENTIAL ARCHEOLOGICAL SITES



CULTURAL RESOURCES SURVEY



PREHISTORIC SITE



BORDER OF STUDY AREA

TOXXX - SMITHSONIAN SITE NUMBER

STEWARDS #X - JULIAN STEWARD SURVEY

XXX-XXX - BLM CULTURAL RESOURCES SURVEY NUMBER

ARMY
CULTURAL
RESOURCES
SURVEY
1978 141 33

2600 N+

1500 N+

4ASE

300 S+

870 S+

1300 S+

5200 S+

6500 S+

1800 S+

9100 S+

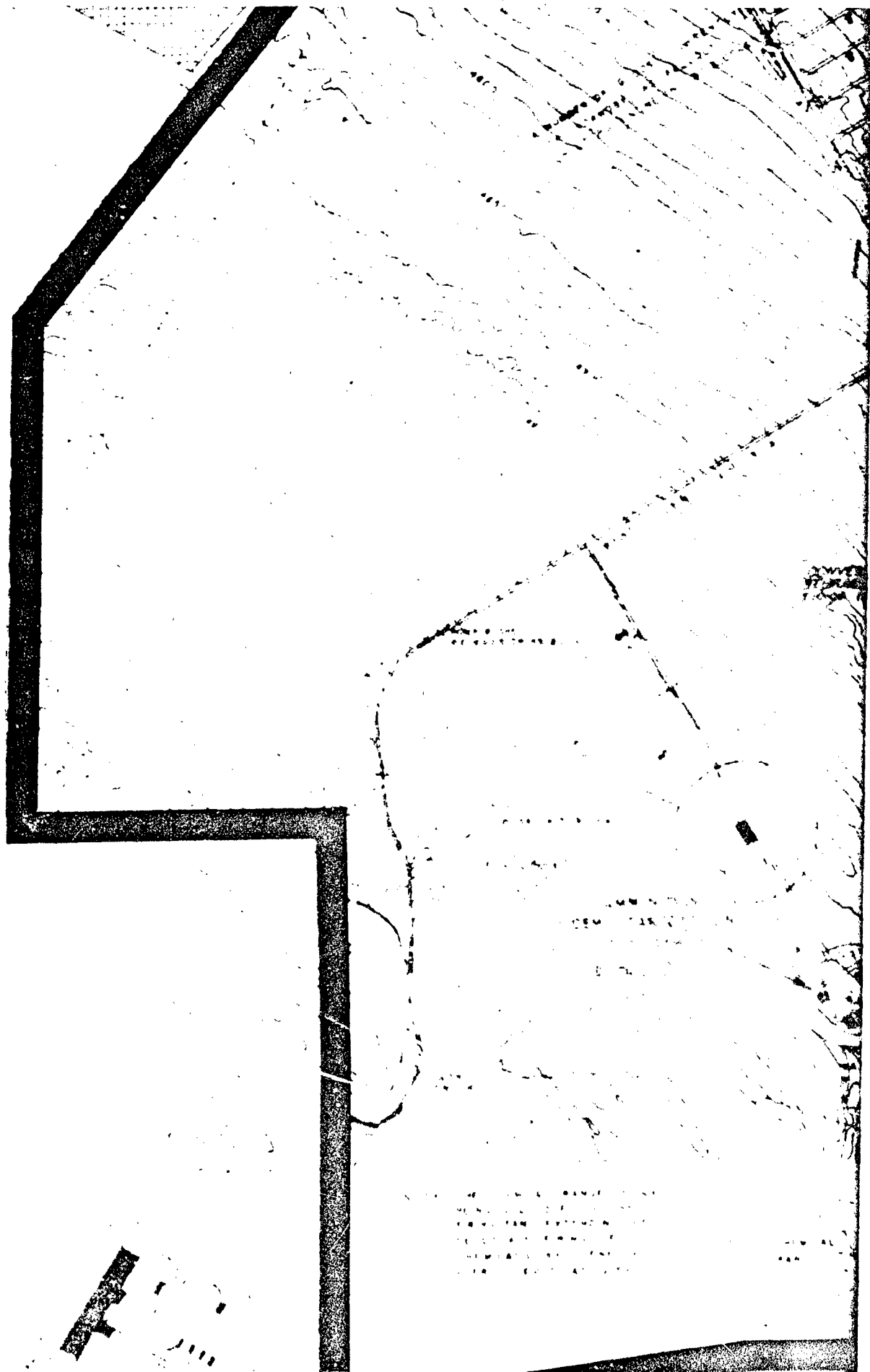
4100 S+

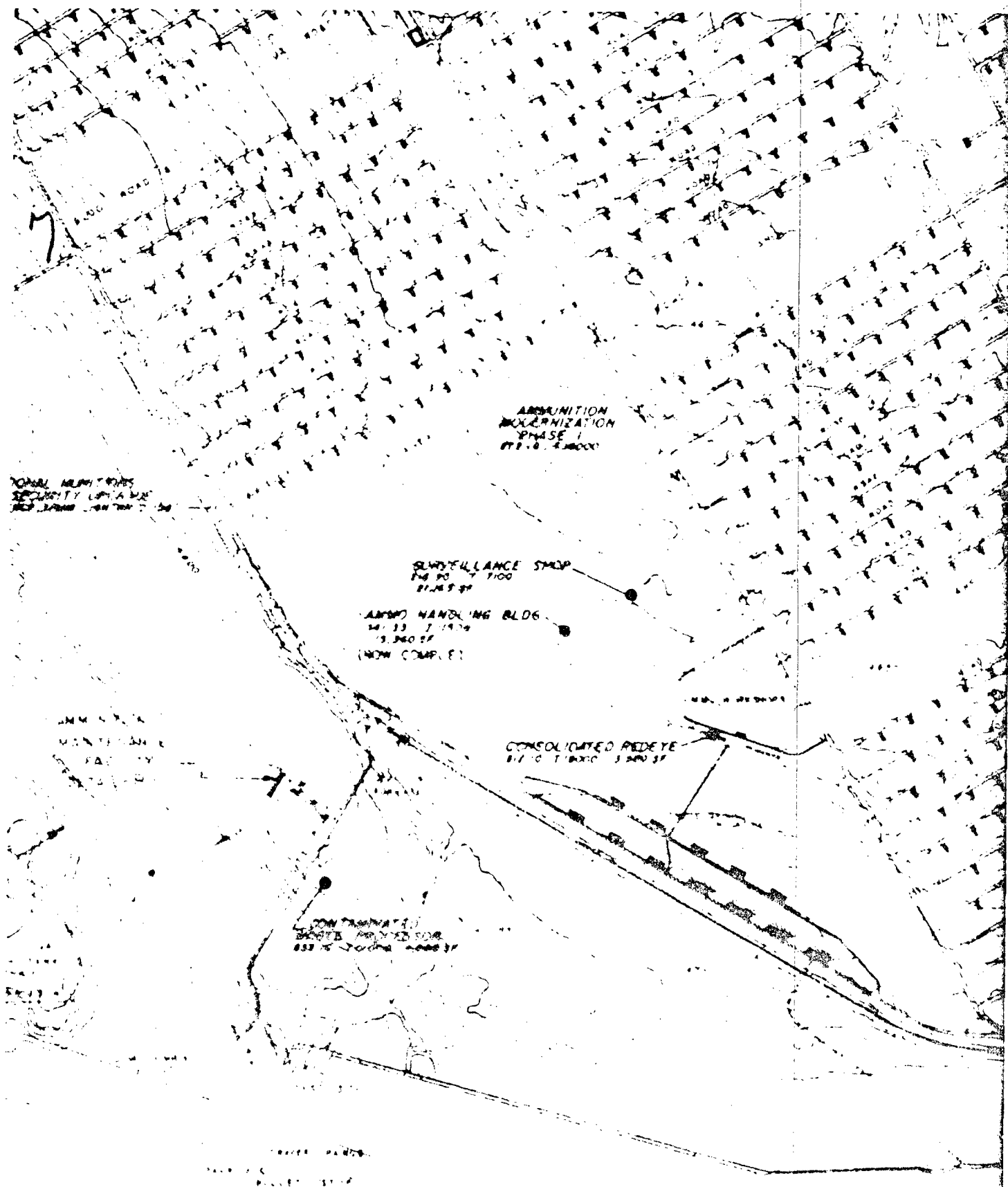
1000 S+

5700 S+

1400 S+

6



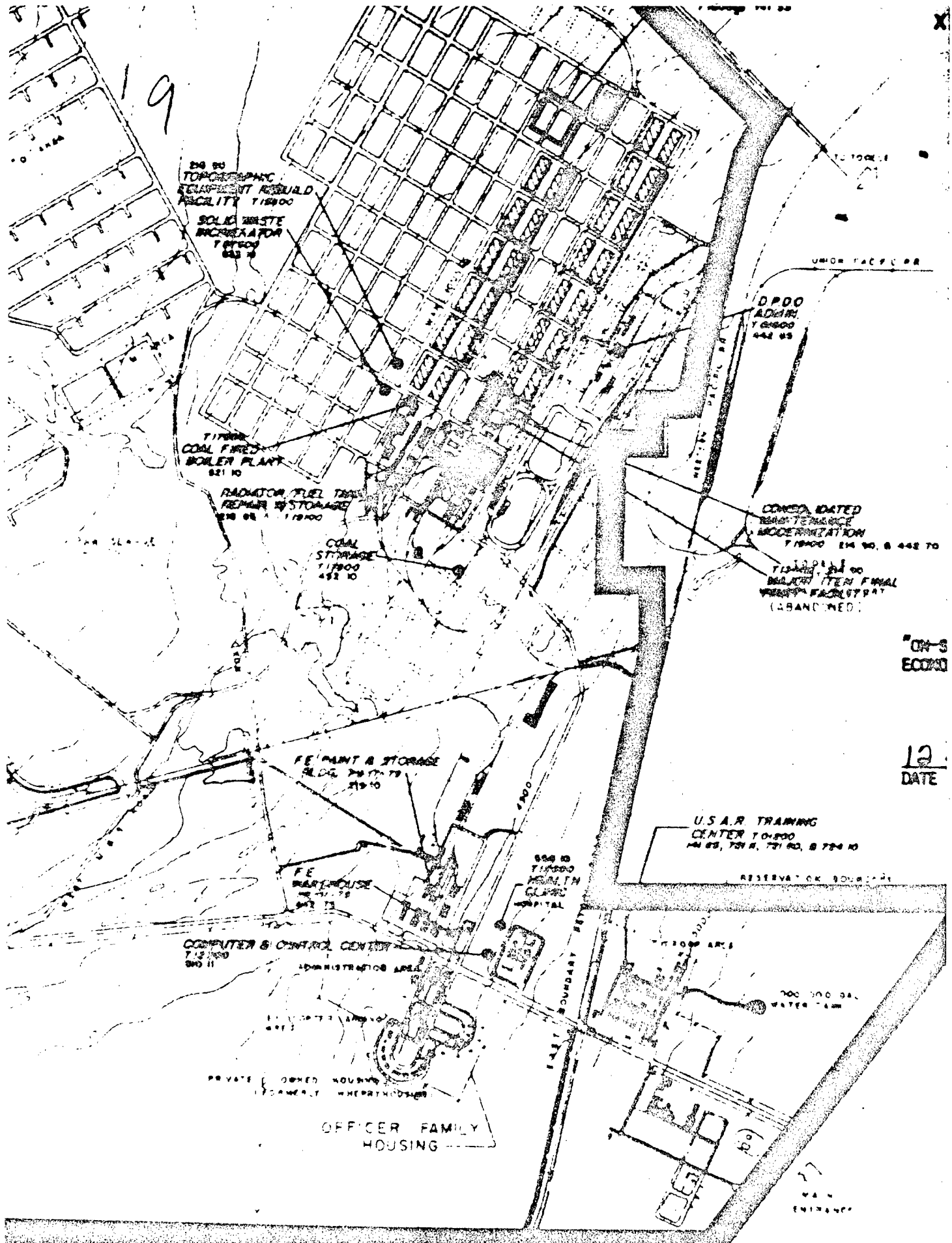


18

CONTAINER
PAID 454 10
71800
4,333 54

AMMUNITION
MODERNIZATION
PHASE I
87810 T19000

AMMO COMMUNICATION BOARD



250 00
TOP SECRETARY
EQUIPMENT REBUILD
FACILITY 118400
SOLID WASTE
INCINERATOR
118500
642 10

71000
COAL FIRED
BOILER PLANT
621 10

RADIATION FUEL TANK
REPAIR & STORAGE
218 00 118400

COAL
STORAGE
118500
452 10

FE PAINT & STORAGE
218 00 118400

FE
BURNHOUSE
118500
642 10

COMPUTER & CONTROL CENTER
118500
642 10

ADMINISTRATIVE AREA

PRIVATE OWNED HOUSING
118500
642 10

OFFICER FAMILY
HOUSING

DPDO
118500
642 10

CONCRETE REINFORCED
ROADSIDE FACILITY
118500 218 00, 6 442 10

TISHING
118500
642 10
BURNHOUSE
118500
642 10
(ABANDONED)

U.S.A.R. TRAINING
CENTER 118500
642 10, 701 10, 701 10, 8 724 10

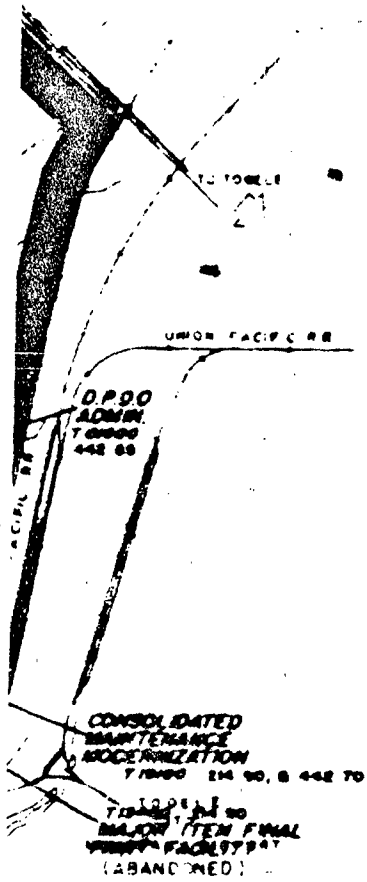
RESERVATION

WATER TANK

ENGINEER

XXX-XXX - BLM CULTURAL RESOURCES SURVEY NUMBER

10

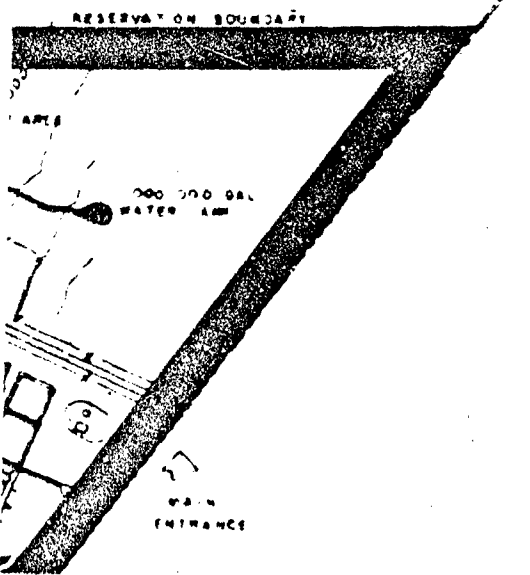


"ON-SITE INSPECTION HAS BEEN COMPLETED FOR ENVIRONMENTAL, HISTORICAL, ECONOMIC, AND OPERATIONAL CONSIDERATIONS FOR EACH PROPOSED ITEM."

12 Aug 1982
DATE

Dennis E. Bingham
DENNIS E. BINGHAM
CHIEF, FACILITIES ENGINEERING DIVISION

S.A.R. TRAINING
ENTER 7 01000
65, 700 0, 701 00, 8 700 10



NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN.



9100-S-

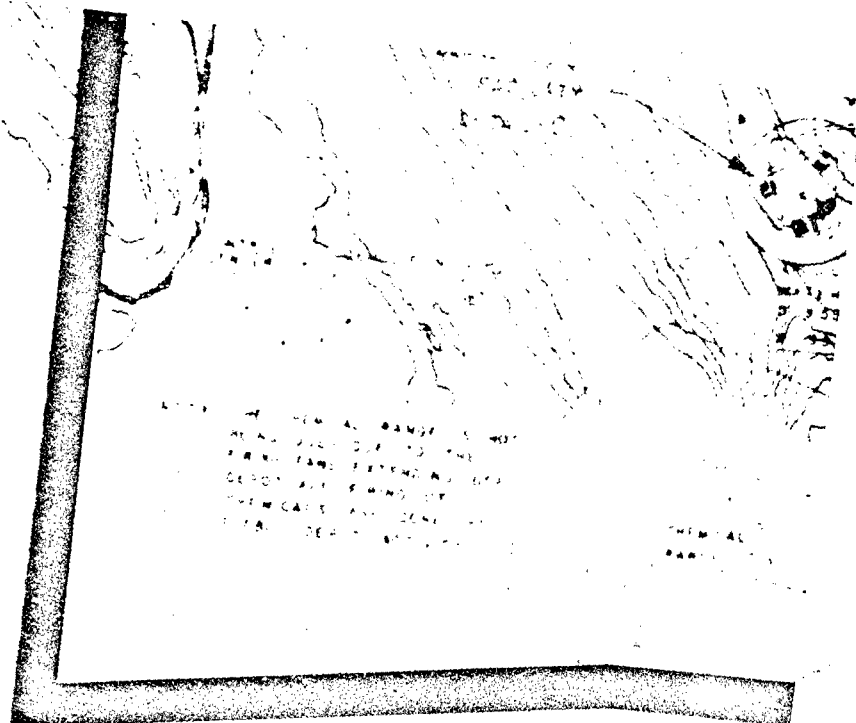
1000-S

1200-S

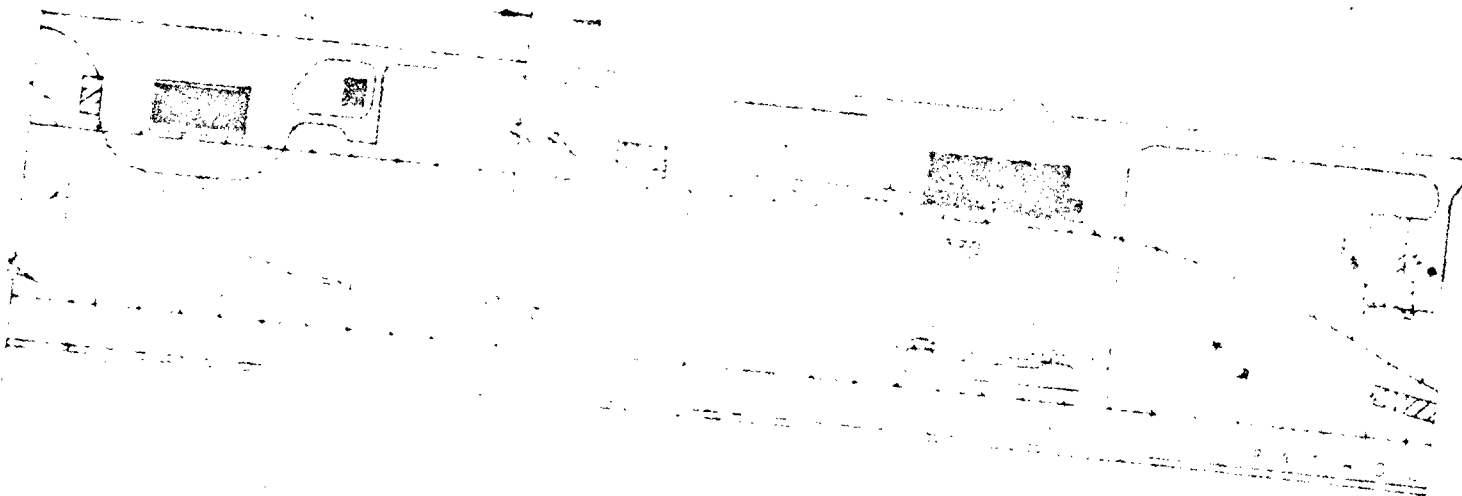
1300-S

1400-S

1500-S

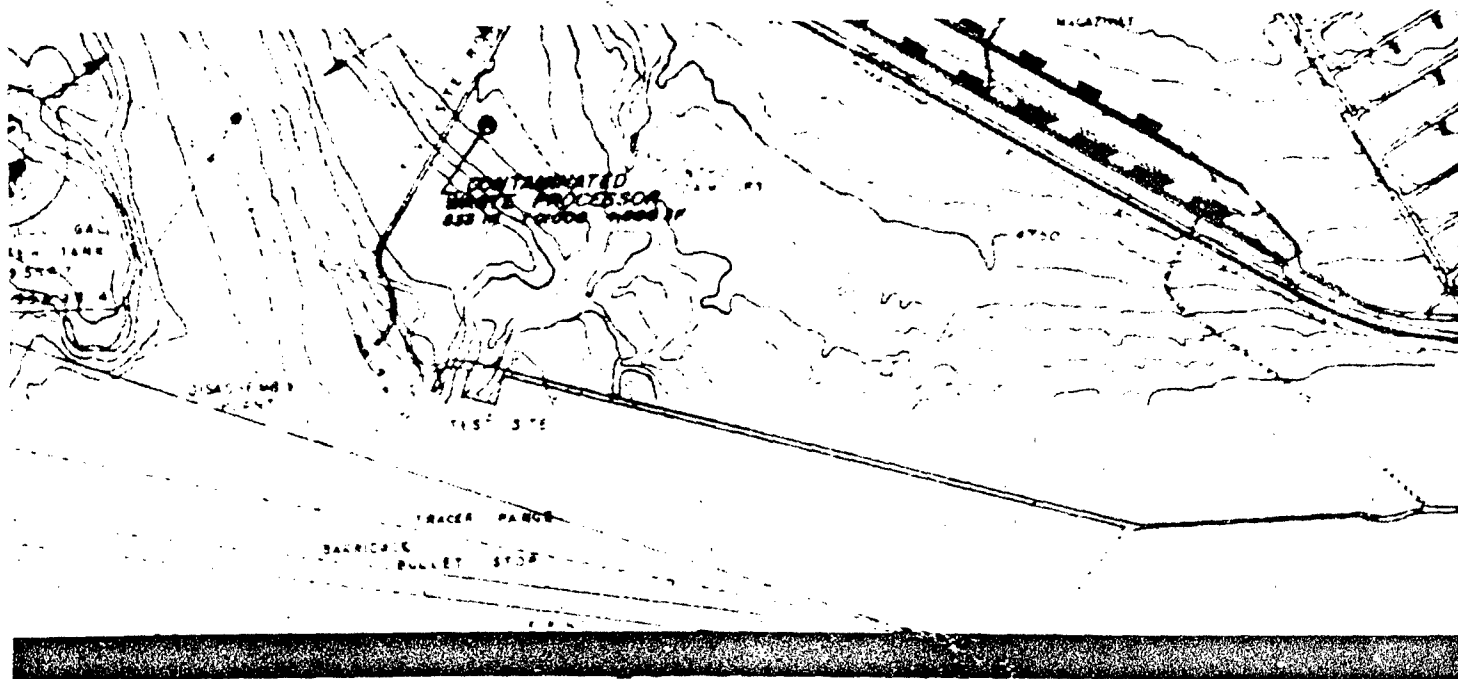


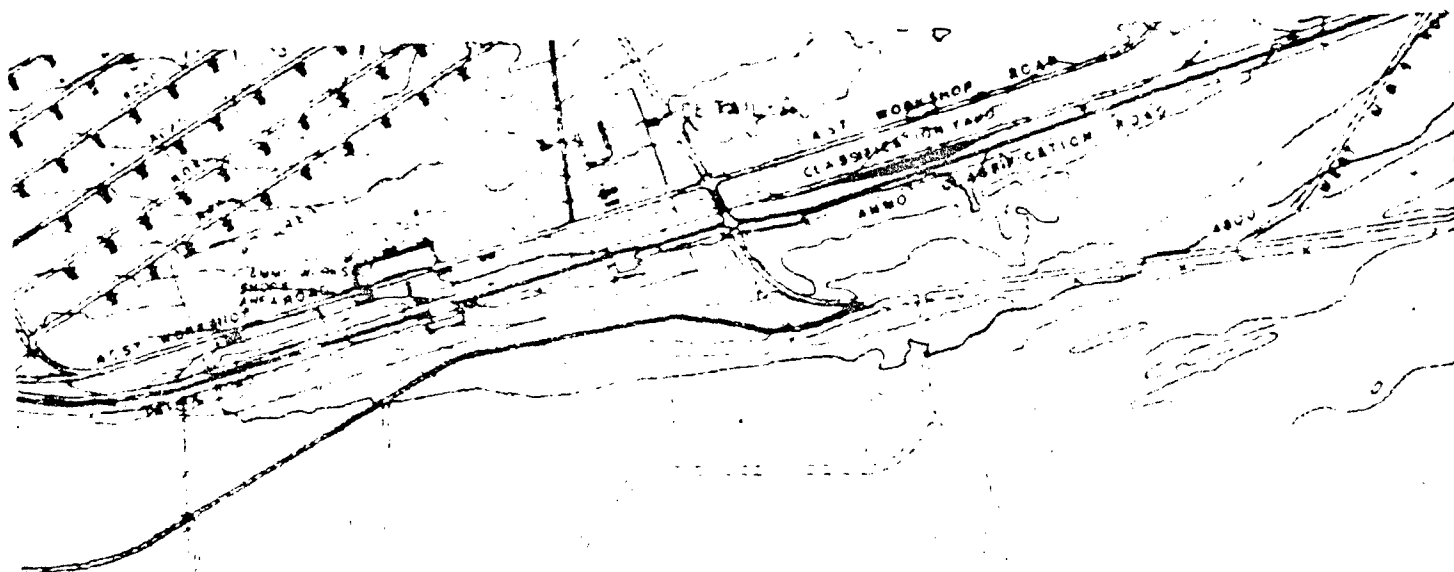
AMMUNITION WORKSHOPS



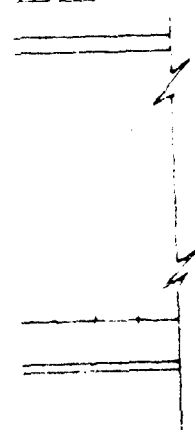
ENLARGED AMMUNITION WORKSH

//





BATTERY
SHOP
249 50
249 54 78
2,000 57



LEGEND

EXISTING FOR
TO BE DETACHED

PROPOSED

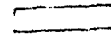
EXISTING



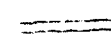
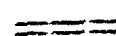
BUILDINGS, PERMANENT



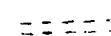
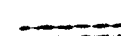
BUILDINGS, SEMI-PERMANENT



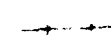
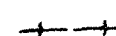
OUTLETS, TEMPORARY



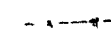
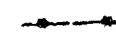
ROADS & TRACKS



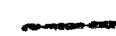
TRAIL OR EARTH ROAD



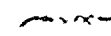
RAILROAD



FENCE



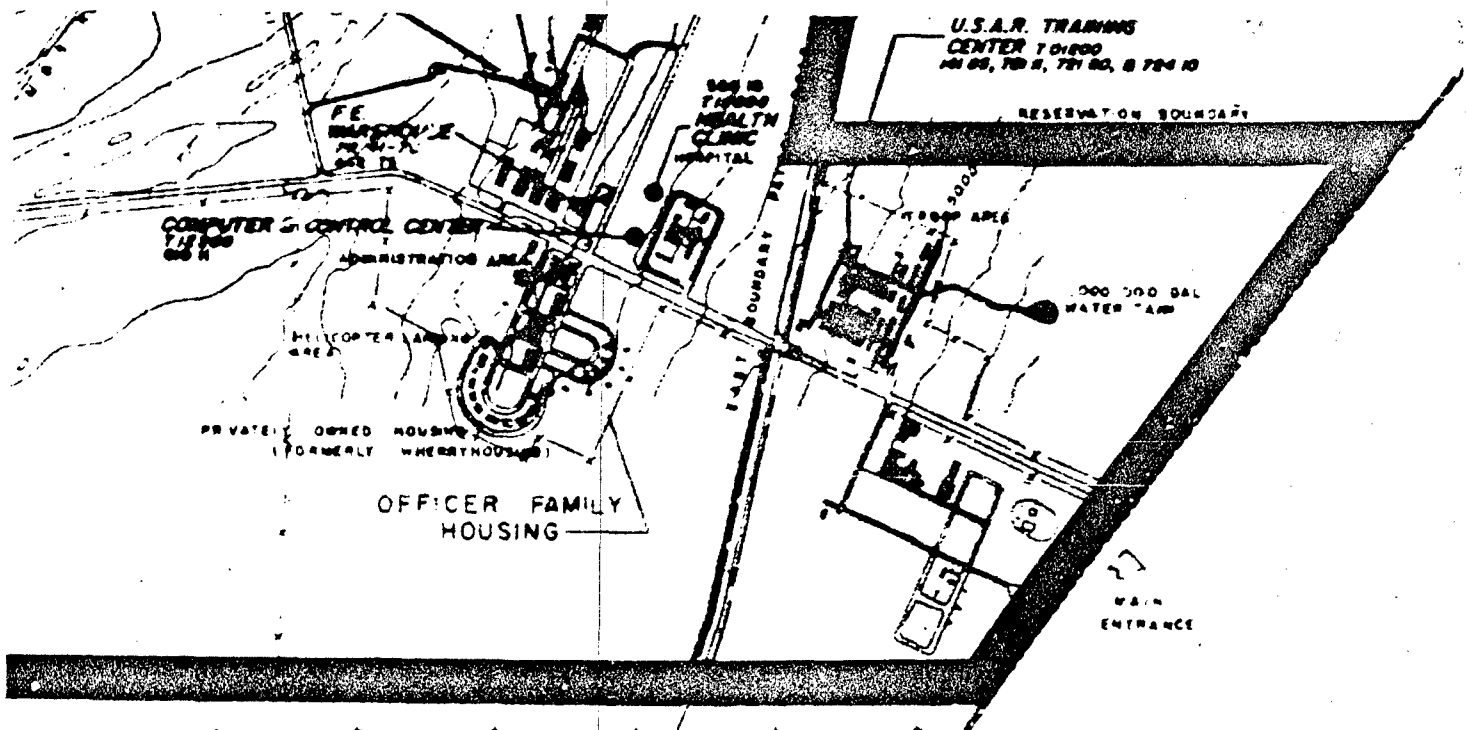
RESERVATION BOUNDARY



INDEX CONTING



INTERMEDIATE CONTING



PERMANENT

SEMI-PERMANENT

TEMPORARY

ROADS

EARTH ROAD

DCI BOUNDARY

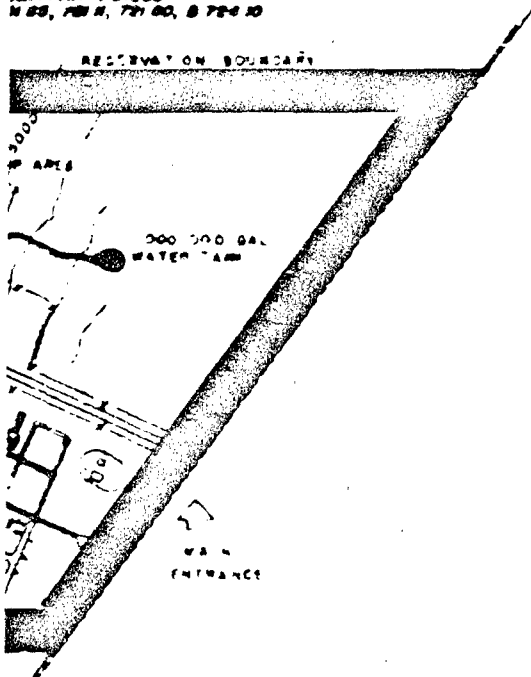
TOUR

ITE CONTOUR

T00

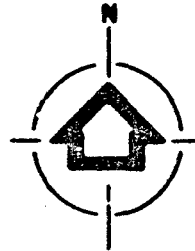
ROBERT G. MUR & AL
ARCHITECTS & PLN
COLORADO SPRINGS, COLO

U.S.A.R. TRAINING
CENTER 101800
N 88, P 81 H, 771 00, 8 724 10



NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN.



SCALE IN FEET

CONTOUR INTERVAL, 20 FEET

TOOELE ARMY DEPOT

TOOELE, UTAH

ROBERT G. MUR & ASSOCIATES
ARCHITECTS & PLANNERS
COLORADO SPRINGS, COLORADO 80903

U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA 95814

MASTER PLAN PLANS FOR FUTURE DEVELOPMENT GENERAL SITE PLAN

APPROVED BY THE DISTRICT ENGINEER FOR THE DISTRICT

Henry G. K... ..
DISTRICT ENGINEER

SEP 1932
PREPARED BY R. G. MUR

DATE
SEPT 1932

DRAWING NO.
18-04-01

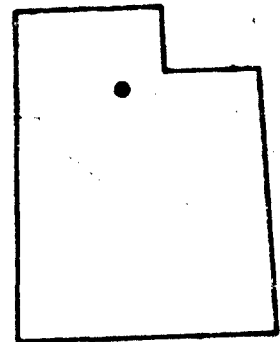
SCALE
4" = 20'

FILE NO.

TOOELE ARMY DEPOT

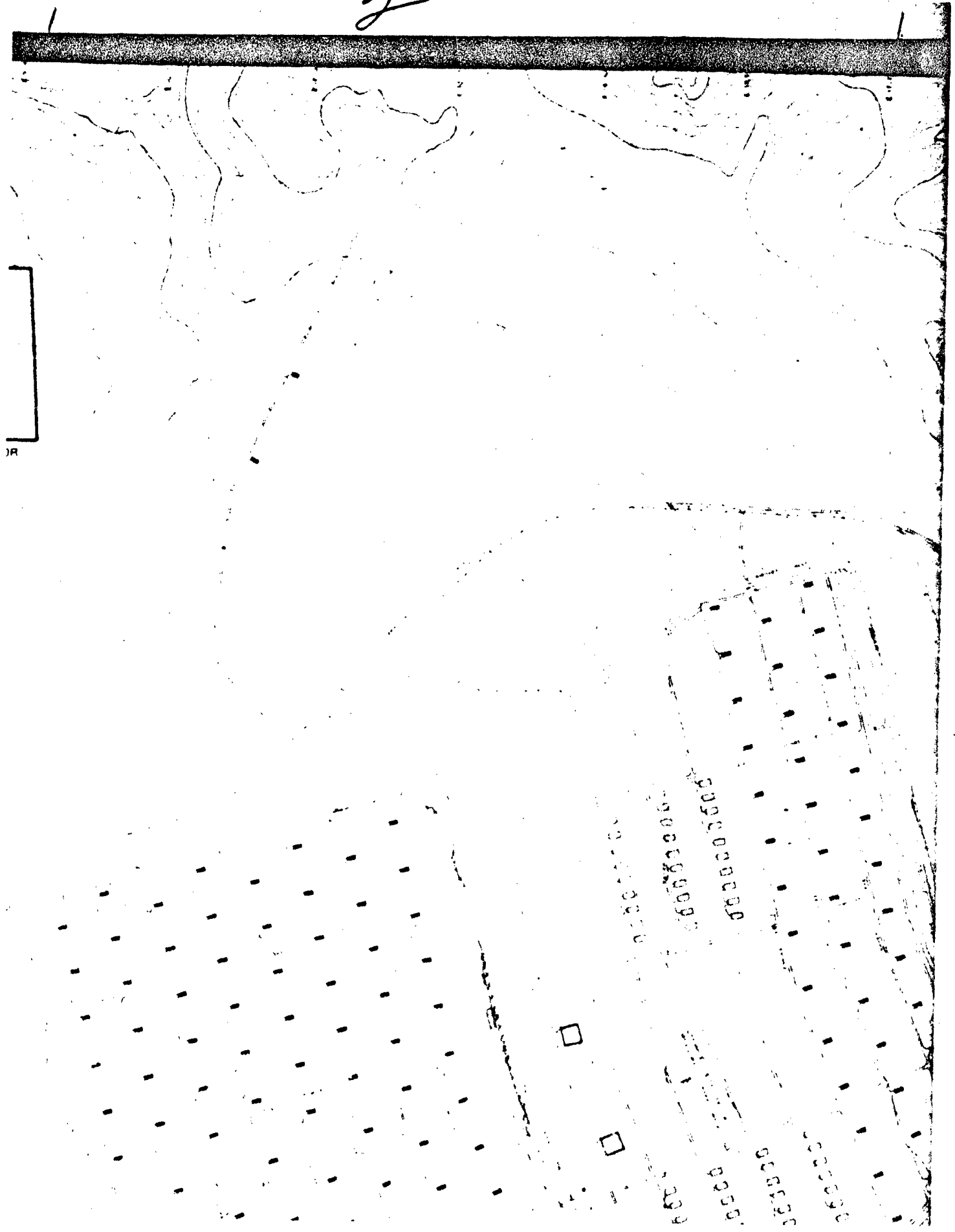
SOUTH POST

**Figure 5-2 KNOWN, POTENTIAL
AND
SURVEYED ARCHEOLOGICAL SITES**

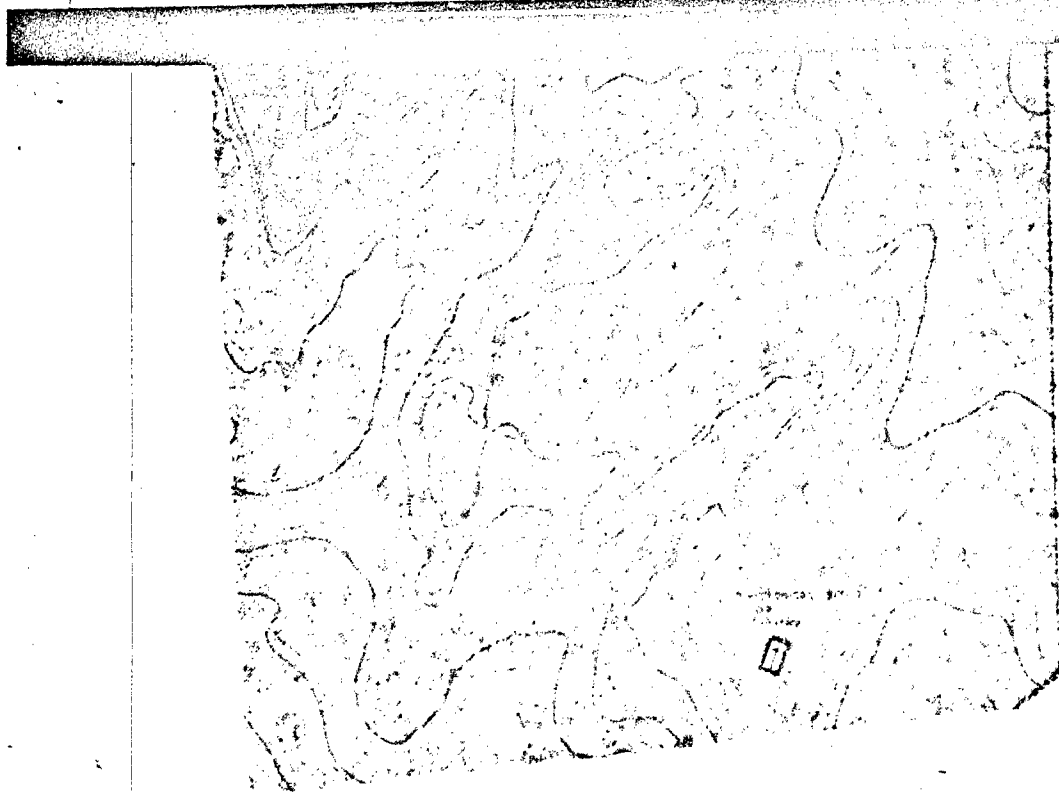


UTAH MAP LOCATOR
SALT LAKE CITY

]



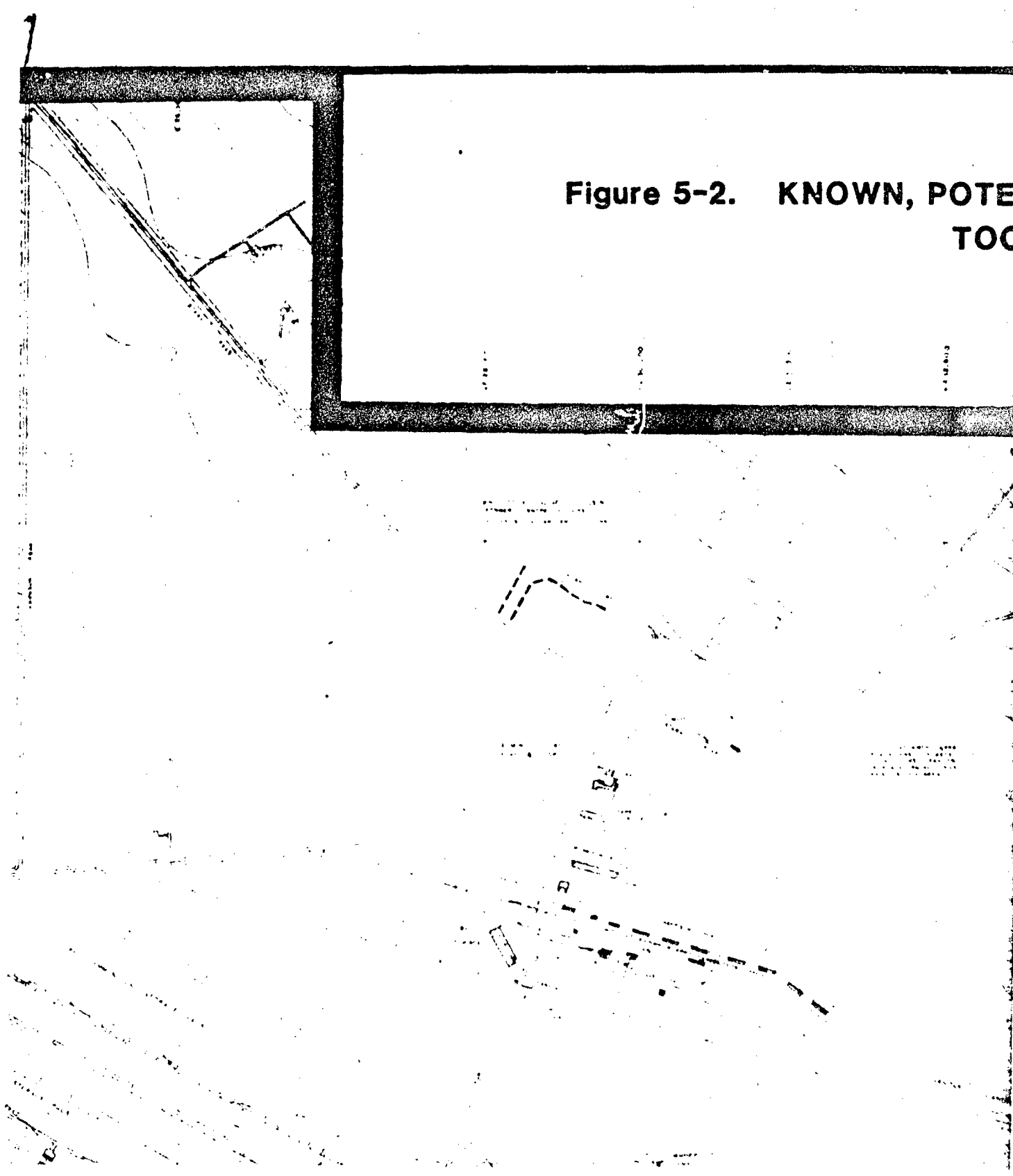
3



4

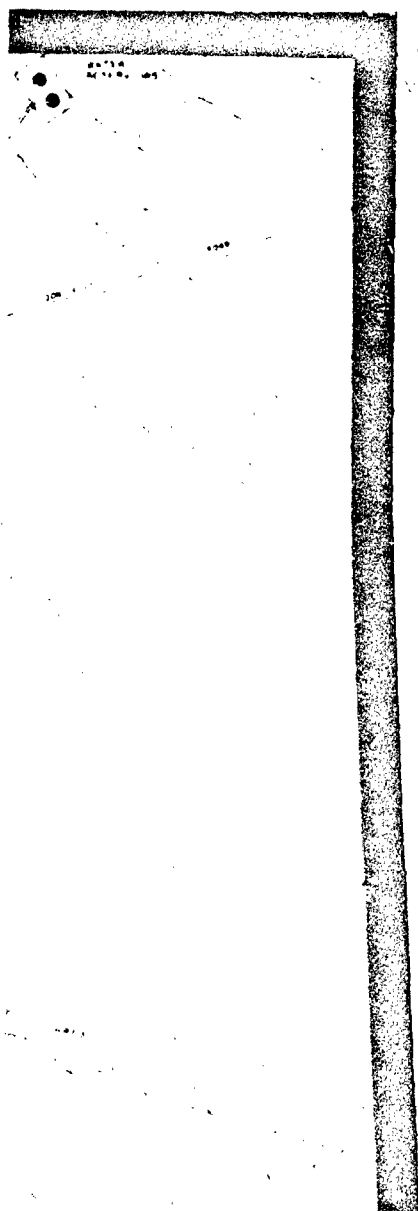
1

**Figure 5-2. KNOWN, POTE
TOO**



2

**POTENTIAL AND SURVEYED ARCHEOLOGICAL SITES
DELE ARMY DEPOT - SOUTH POST**



AREAS OF POTENTIAL
ARCHEOLOGICAL SITES



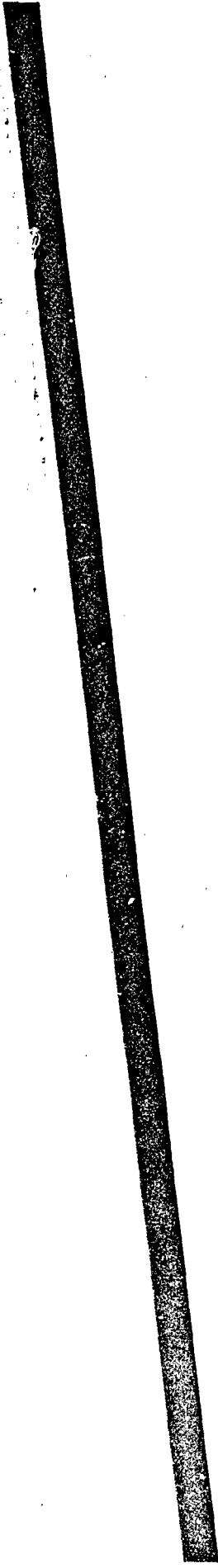
HISTORIC SITE



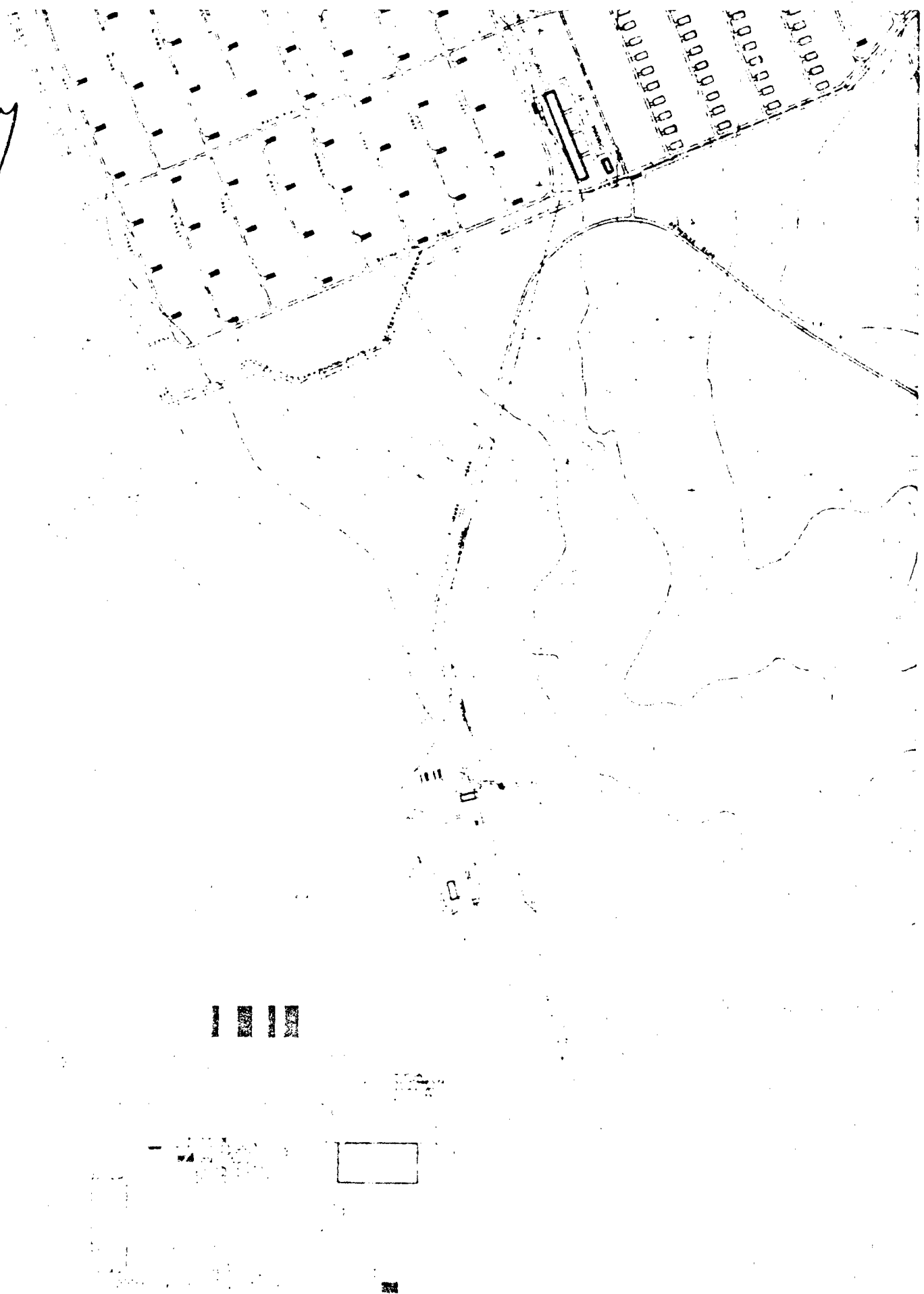
BORDER OF STUDY AREA

11

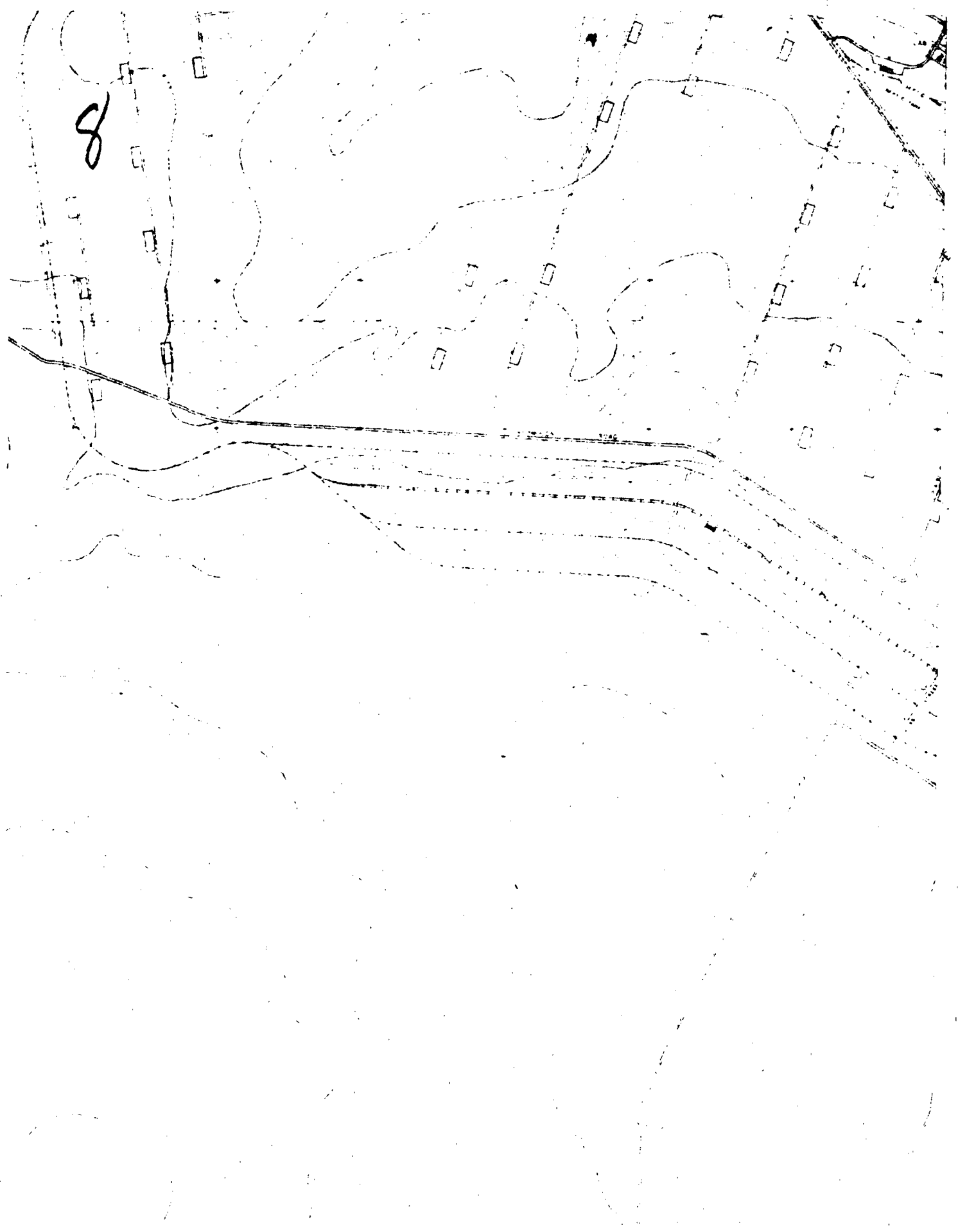
6



7



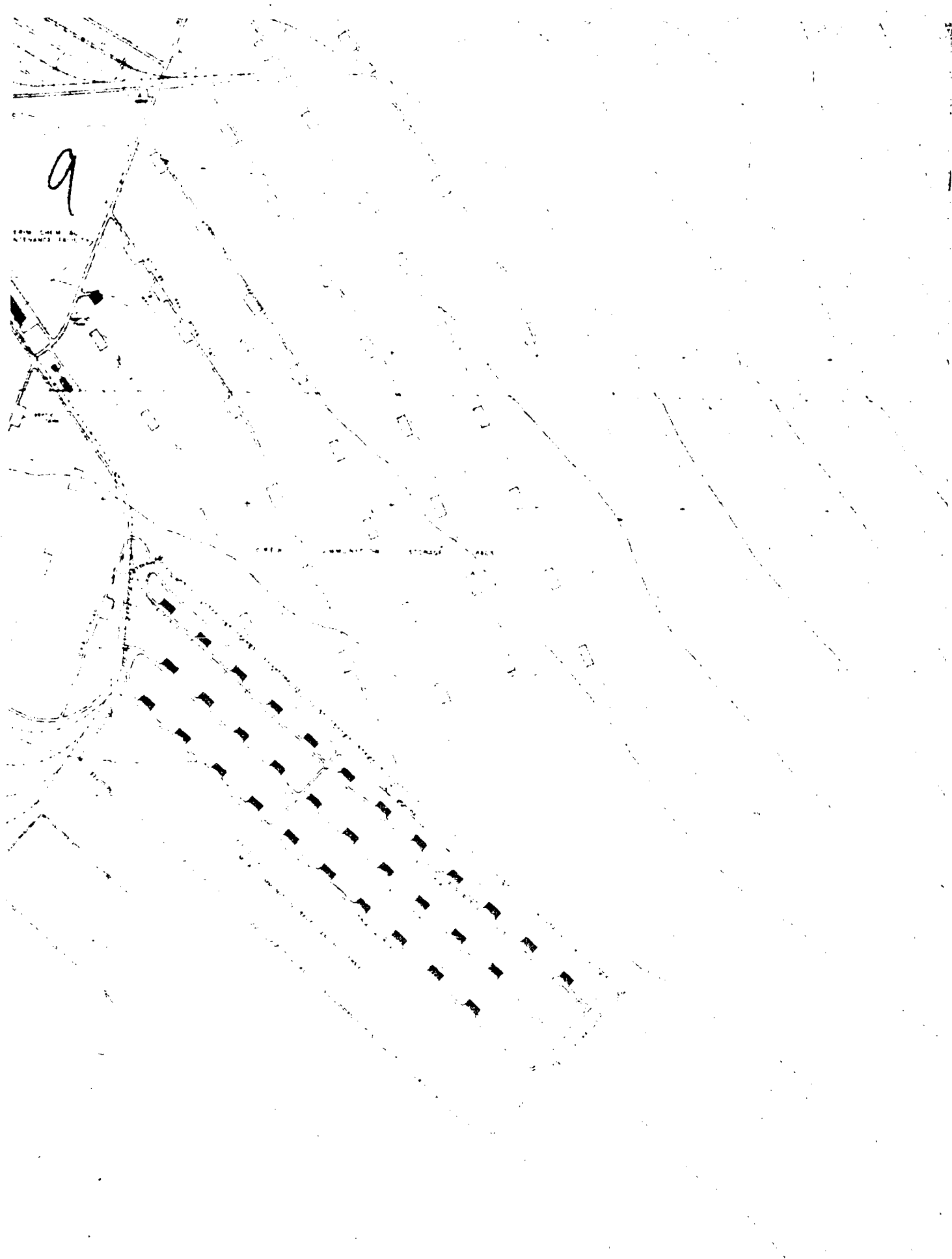
8



9

SPRING CREEK AND
ADJACENT TERRITORY

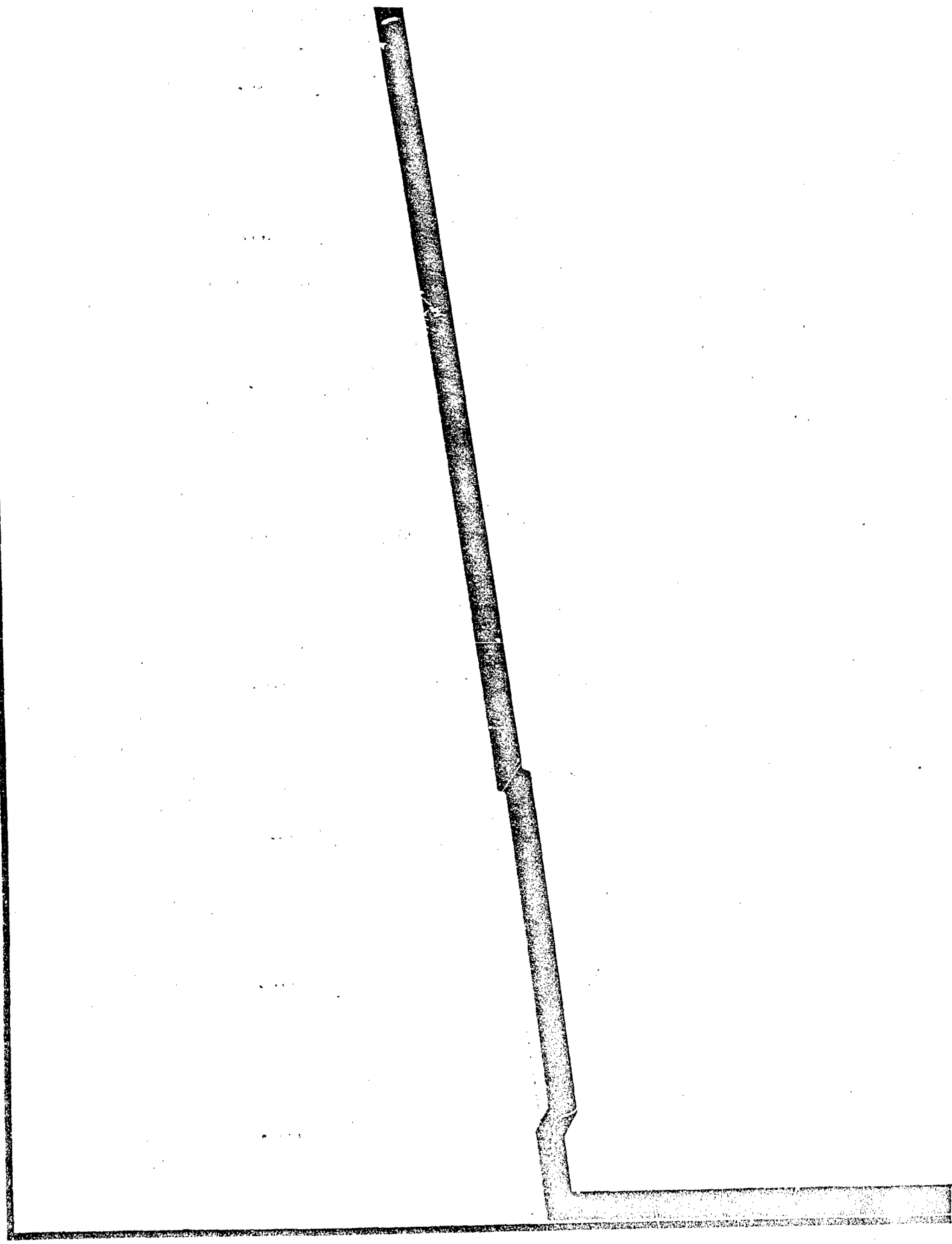
SPRING CREEK AND
ADJACENT TERRITORY

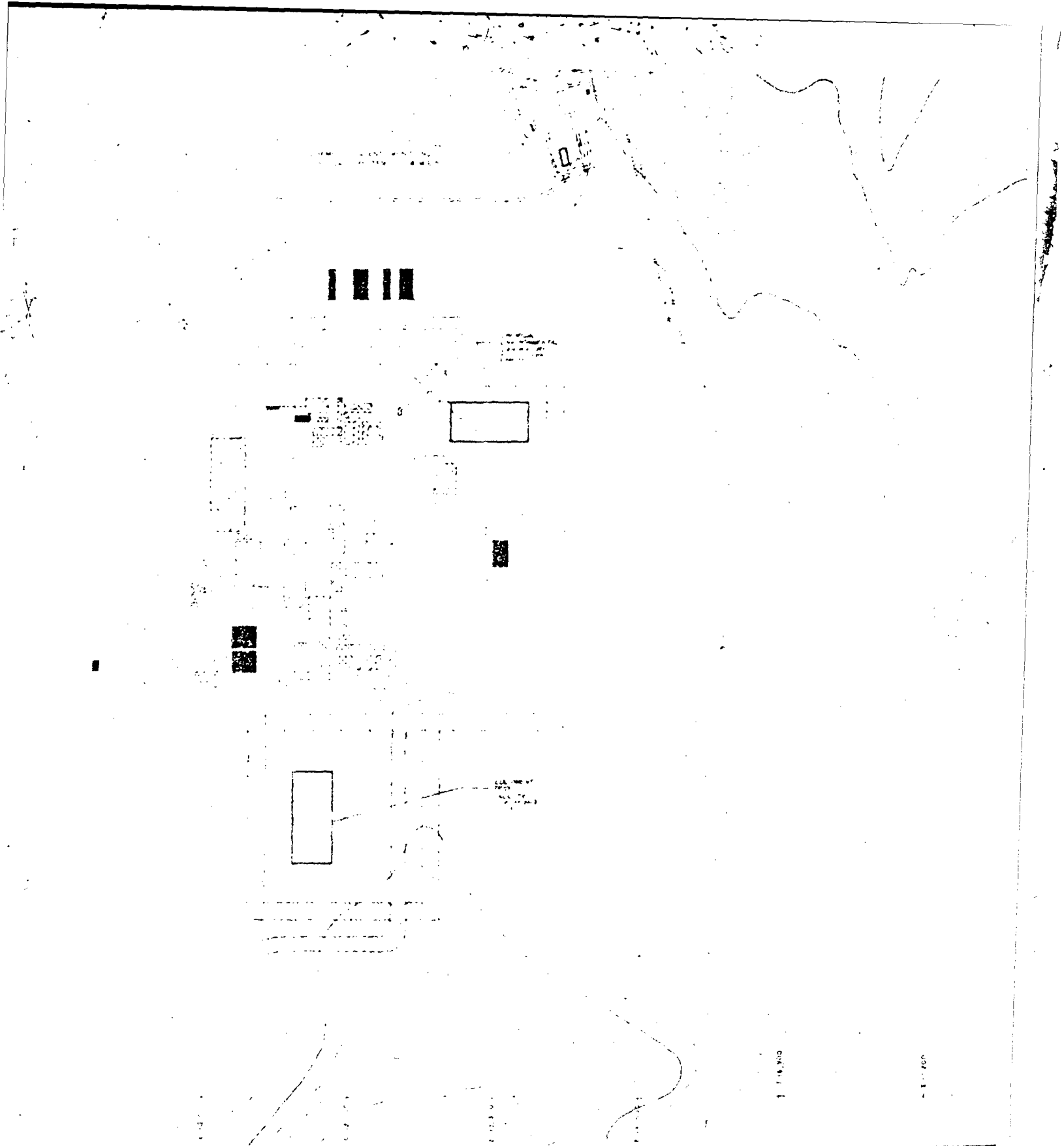


2, 3, 4, 5, 6

10

[illegible]





12

4 6 8.500

4 6 8.500

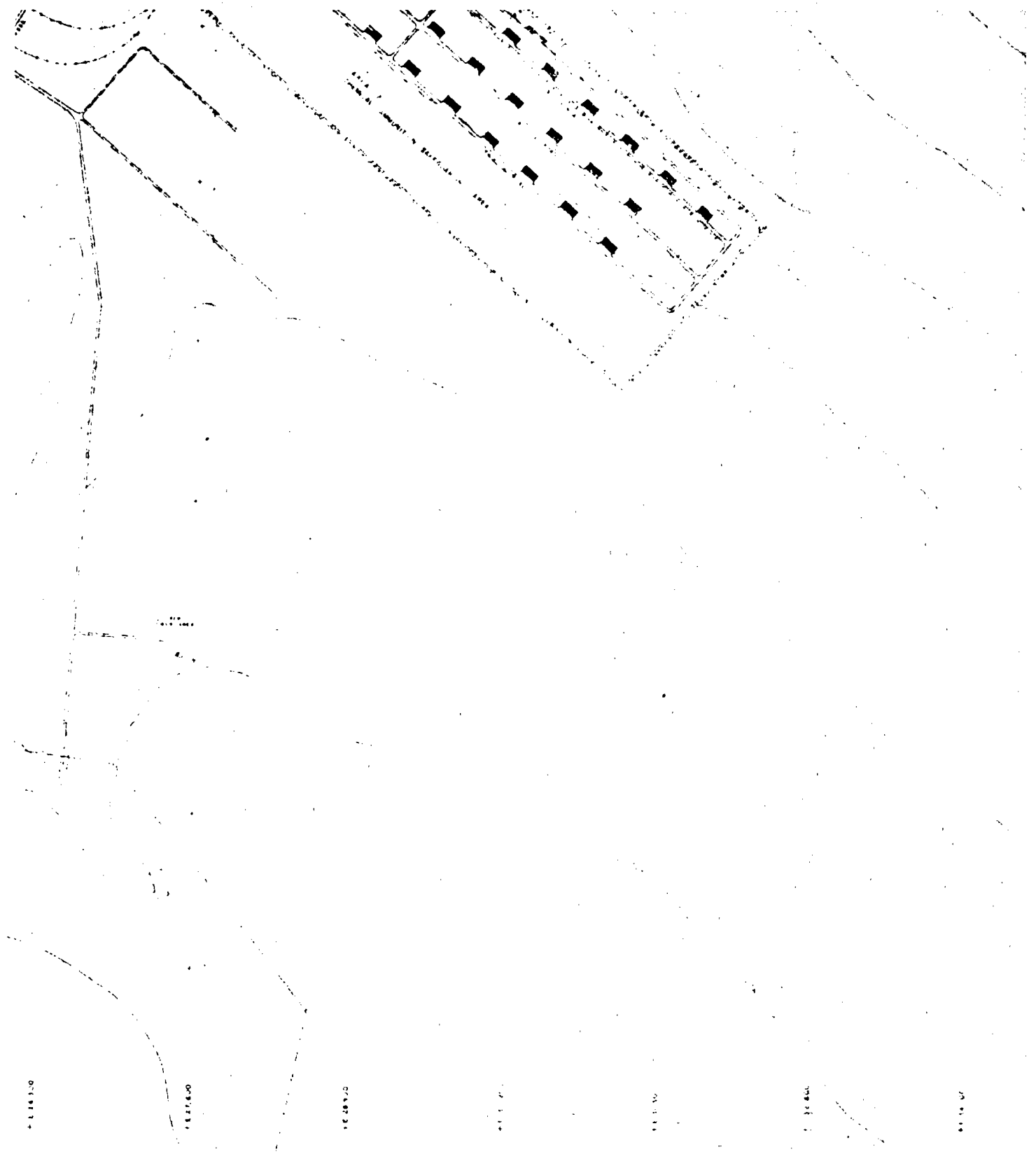
4 6 8.500

4 6 8.500

4 6 8.500

4 6 8.500

4 6 8.500



14

In either case, conservation or excavation, an ideal program also would incorporate an interpretative component in which the public is provided with the substance of the information values that are inherent in the resources present.

SECTION 6

CHAPTER 6.0 A RECOMMENDED ARCHEOLOGICAL MANAGEMENT PLAN FOR TOOELE ARMY DEPOT

6.1 FACILITY MASTER PLAN

Planning for future facilities and site development has been completed through the year 1990. Figures 6-1 and 6-2 define the area where ground-disturbing activities will occur. Based on the Facilities Master Plan map and the Installation Environmental Assessment, the following are areas of proposed ground-disturbing activities for both North and South Posts.

6.1.1 Proposed Activities - North Post

Master planning for operational and training facilities in Area I (Figure 6-1) proposes the construction of an ammunition surveillance workshop, located west of Igloo Block D; an ammunition handling building; a contaminated waste process building; a surveillance storage building; a battery shop; and consolidated red-eye building. In Area II (Figure 6-1) a Rifle Range Road extension is proposed. Construction of maintenance and production facilities, an open coal storage, open storage lot, consolidated maintenance modernization, a new paint facility, and a supply distribution center is proposed in Area III (Figure 6-1).

An additional building is planned for Defense Property Disposal Office (DPDO) administration facility and will replace an existing substandard building. It will be located in the disposal yard.

A 32-ton-per-day solid waste incinerator is proposed for Area III in a relatively flat area at the northwest corner of C Avenue and 7th Street. The incinerator system will produce a portion of the installation's heat requirements. Additionally, it will reduce landfill requirements and relieve the present load on the existing central boiler system. The system will consist of three one-ton-per-hour pre-manufactured (package) units. Two of the units will be on-line and the third will provide standby for 24-hour operation.

The following proposed projects are planned for Area IV (Figure 6-1). A new clinic is proposed to replace the existing, outmoded infirmary. The facility will include a pharmacy, out-patient facilities, an ambulance dock, and an equipment room. The facility will be located west of the existing clinic. Three new administrative buildings are proposed, including a command and computer center, a supply company facility, and a supply distribution center facility. The command center will accommodate and consolidate the Commander's office, the computer center, Directorate offices, and administrative/support operations. Other proposed construction activities include a F.E. paint and storage building, and a warehouse and storage shed. Four new barracks are proposed in the U.S.A.R. Training Center. Three of these will replace existing facilities; the fourth will be new construction.

Figure 6-1 defines the modifications and extensions to sewer, electrical, water, and steam lines, and the construction activity areas associated with the proposed facilities (Table 6-1).

TOOELE ARMY DEPOT

NORTH POST

**Figure 6-1 LOCATIONS
OF
ON-GOING AND PLANNED ACTIVITIES**

15800-N
46800-W

43500-W

44200-W

42900-W

4500-W

40300-W

3900-W

5700-W

36400-W

4300-N

3000-N

1700-N

10400-N

900-N

700-N

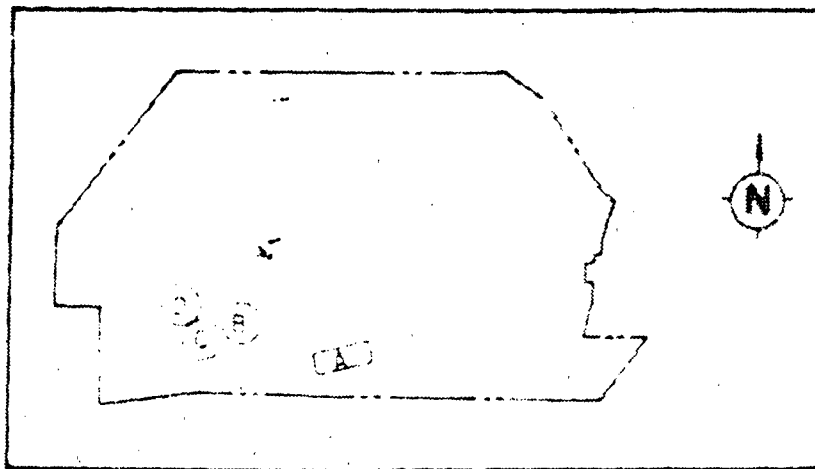
500-N

300-N

100-N

200-N

100-N



KEY MAP

REFUGEE ROAD



AREA II

+ 35100 W

+ 35000 W

+ 32500 W

+ 31200 W

+ 29900 W

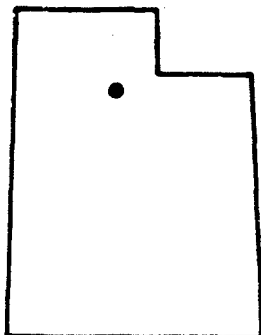
+ 28600 W

+ 27300 W

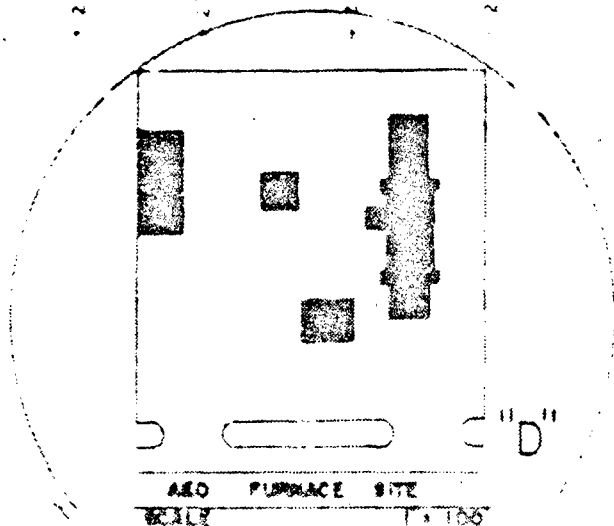
+ 26000 W

+ 24700 W

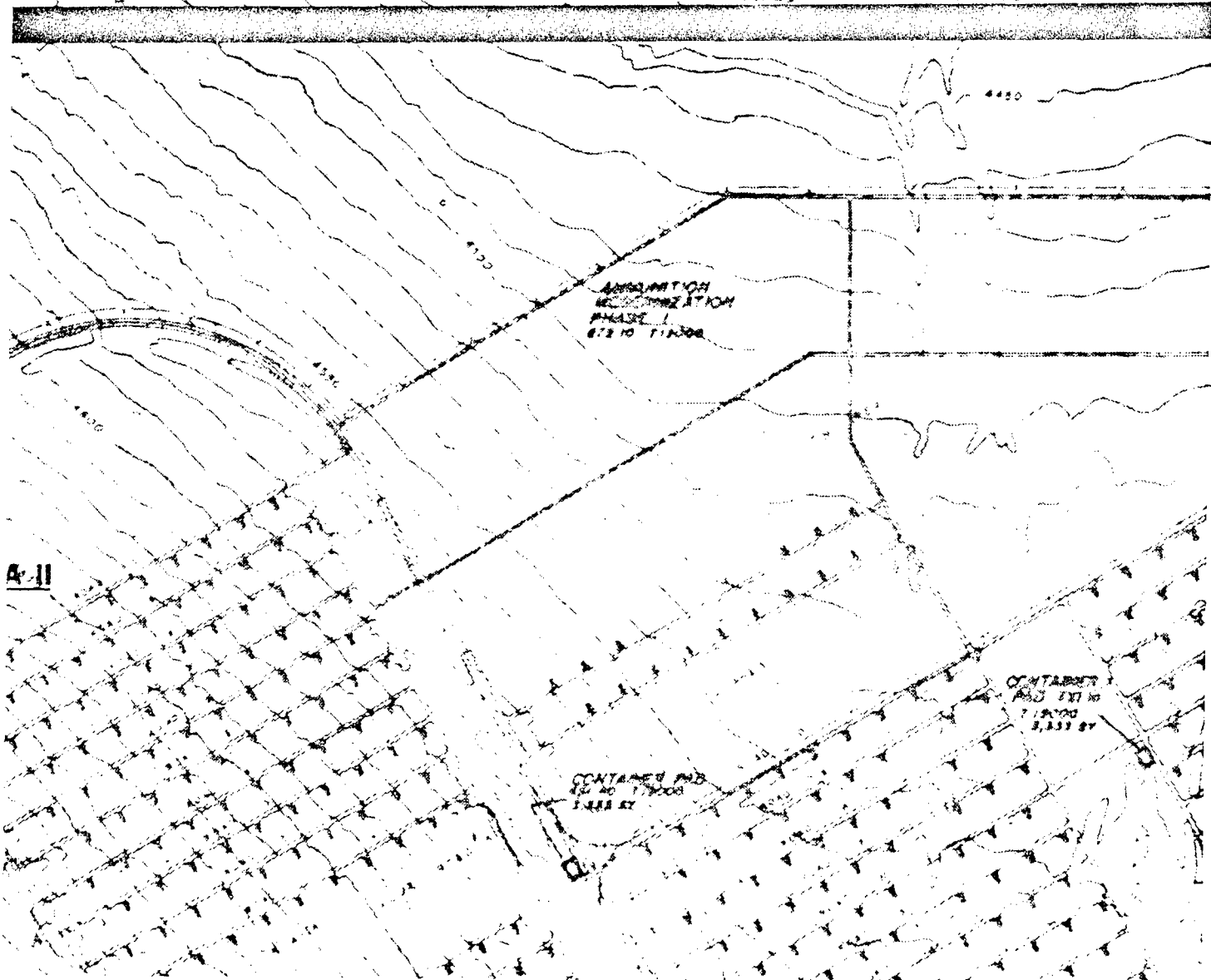
+ 23400 W



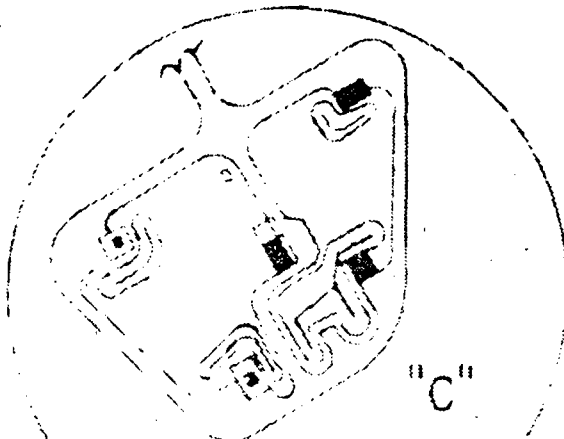
UTAH MAP LOCATOR
SALT LAKE CITY



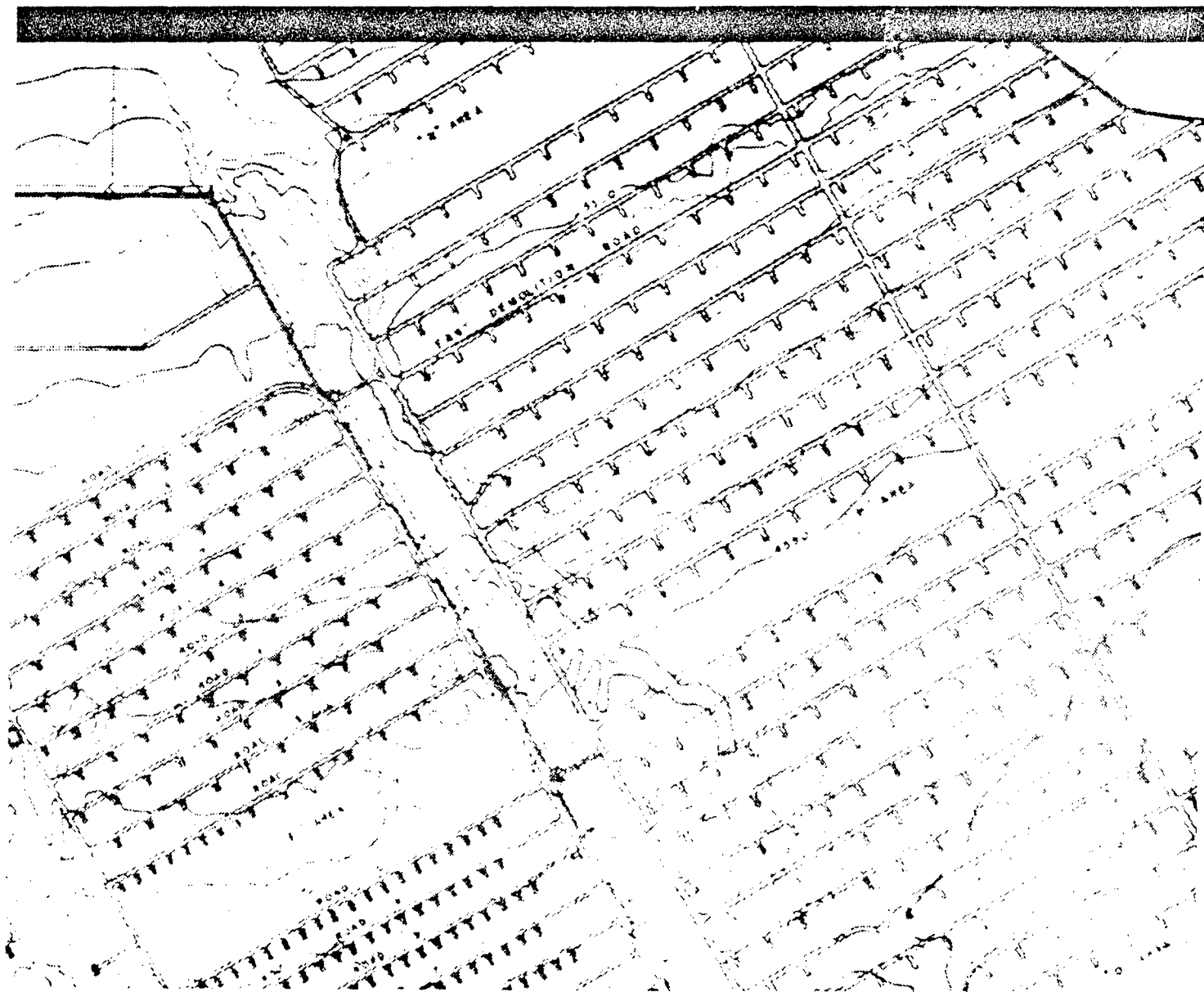
AEO PUMPHOUSE SITE
SCALE 1" = 100'



+ 23000 W
 + 21500 W
 + 20800 W
 + 19500 W
 + 18200 W
 + 16900 W
 + 15600 W
 + 14300 W
 + 13000 W
 + 11700 W
 + 10400 W

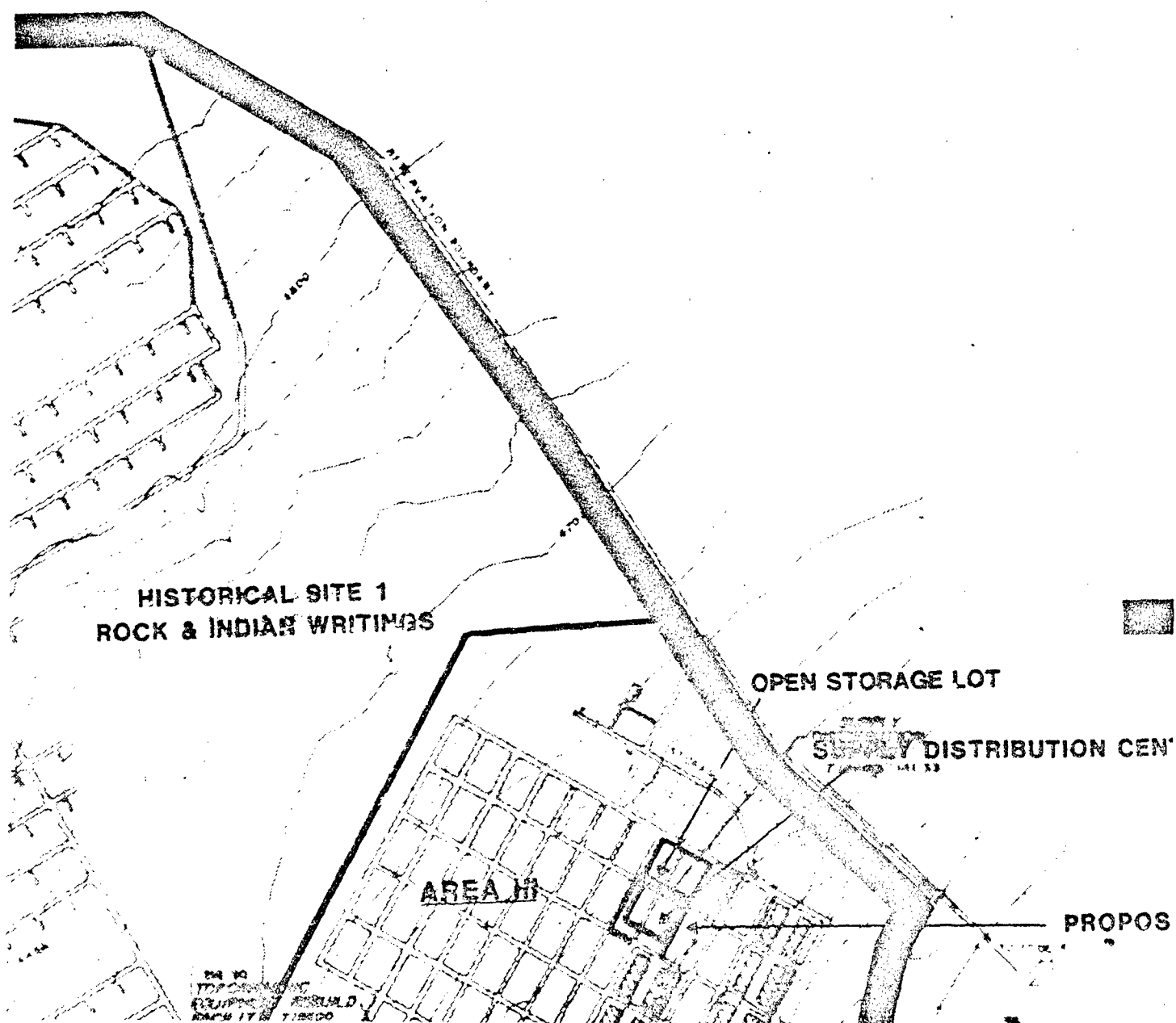


AMMUNITION DEMILITARIZATION FACILITY



9,000 W
 7,800 W
 6,600 W
 5,400 W
 4,200 W
 3,000 W
 1,800 W
 600 W
 MERIDIAN

**Figure 6-1 LOCATIONS OF ON-GOING
TOOELE ARMY DEPOT**



LEWISIAN

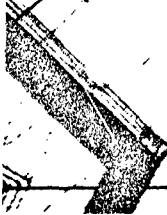
ATIONS OF ON-GOING AND PLANNED ACTIVITIES OOELE ARMY DEPOT - NORTH POST



BORDER OF STUDY AREA

I STORAGE LOT

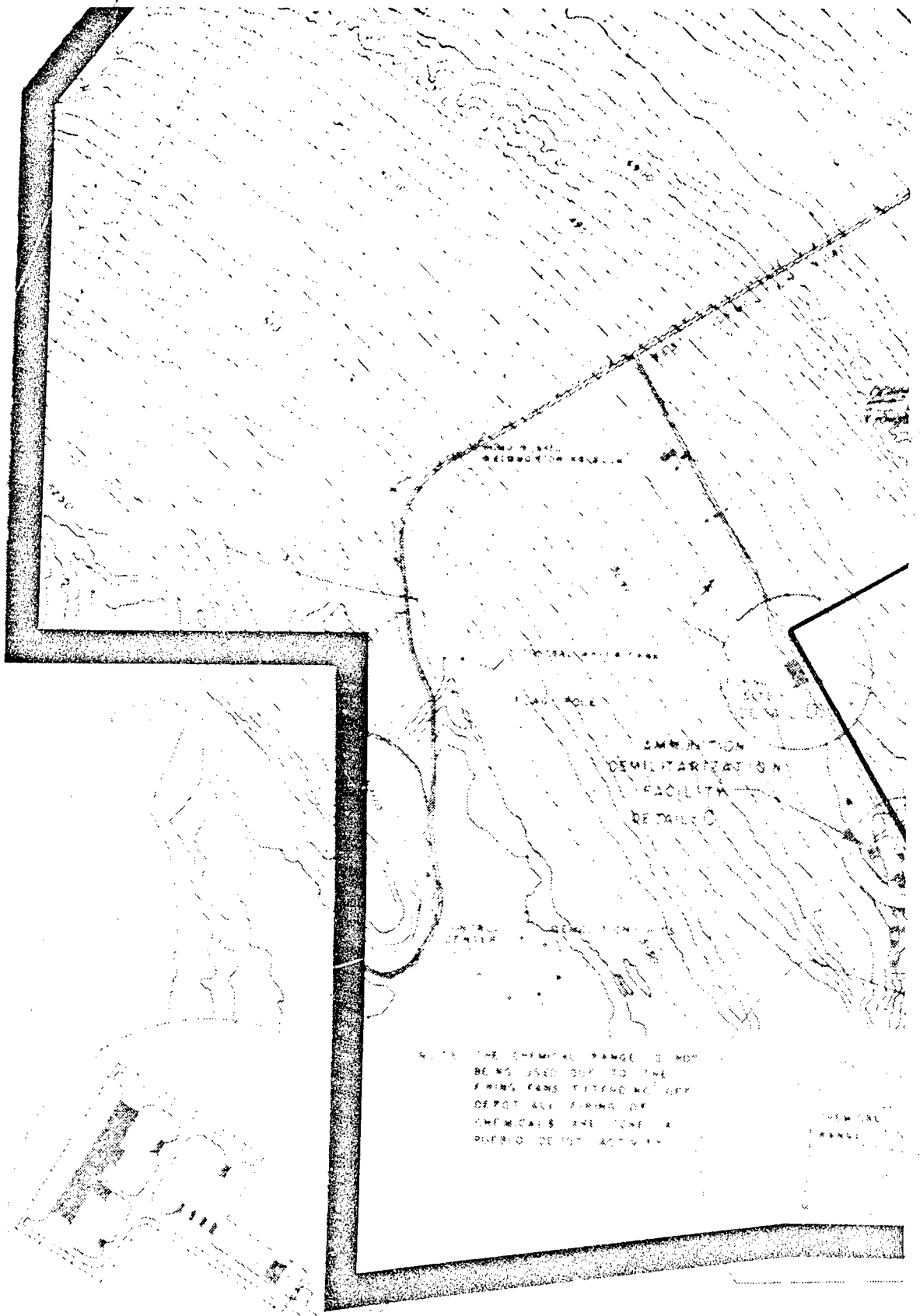
STORAGE
SUPPLY
DISTRIBUTION CENTER



PROPOSED 8 in. WATER LINE

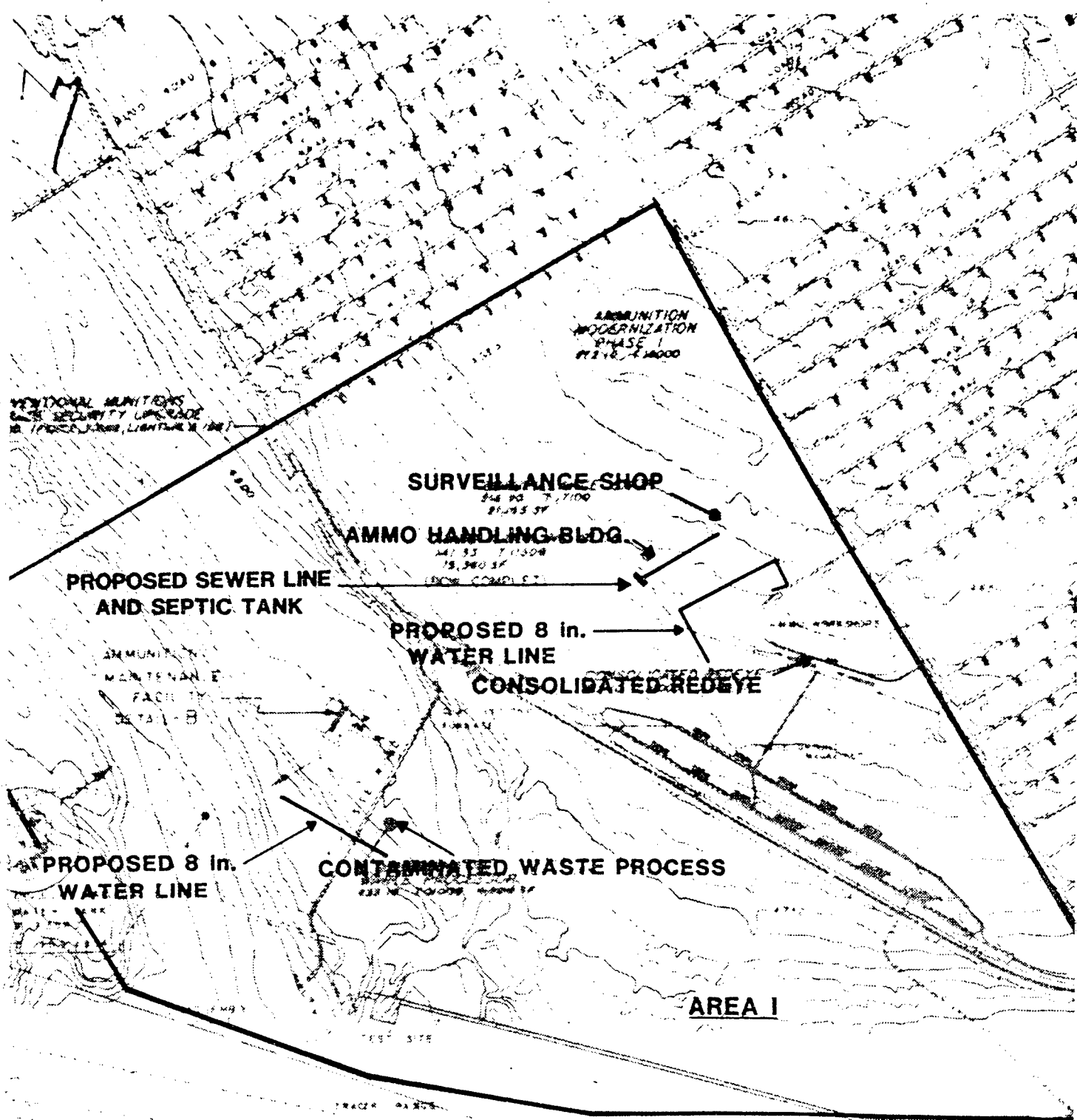
6

500 S+
 2600 S+
 3900 S+
 5200 S+
 6500 S+
 7800 S+
 9100 S+
 10400 S+
 11700 S+
 13000 S+
 14300 S+
 15600 S+

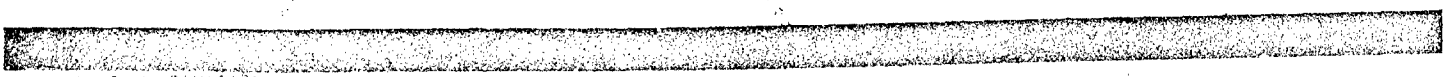
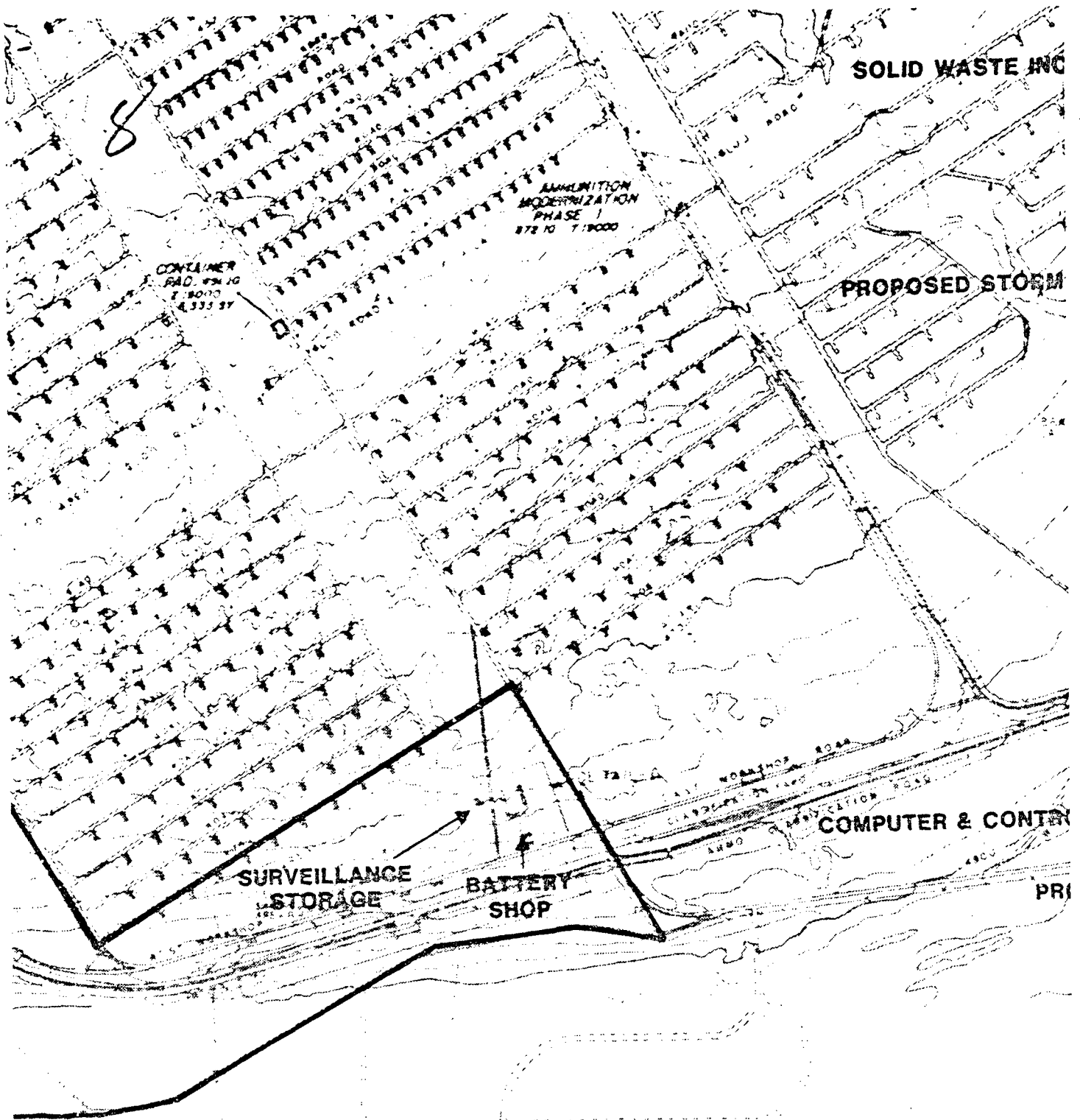


B

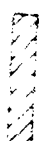
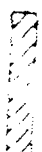
GENERAL MAINTENANCE FACILITY
 500 S+ 1400

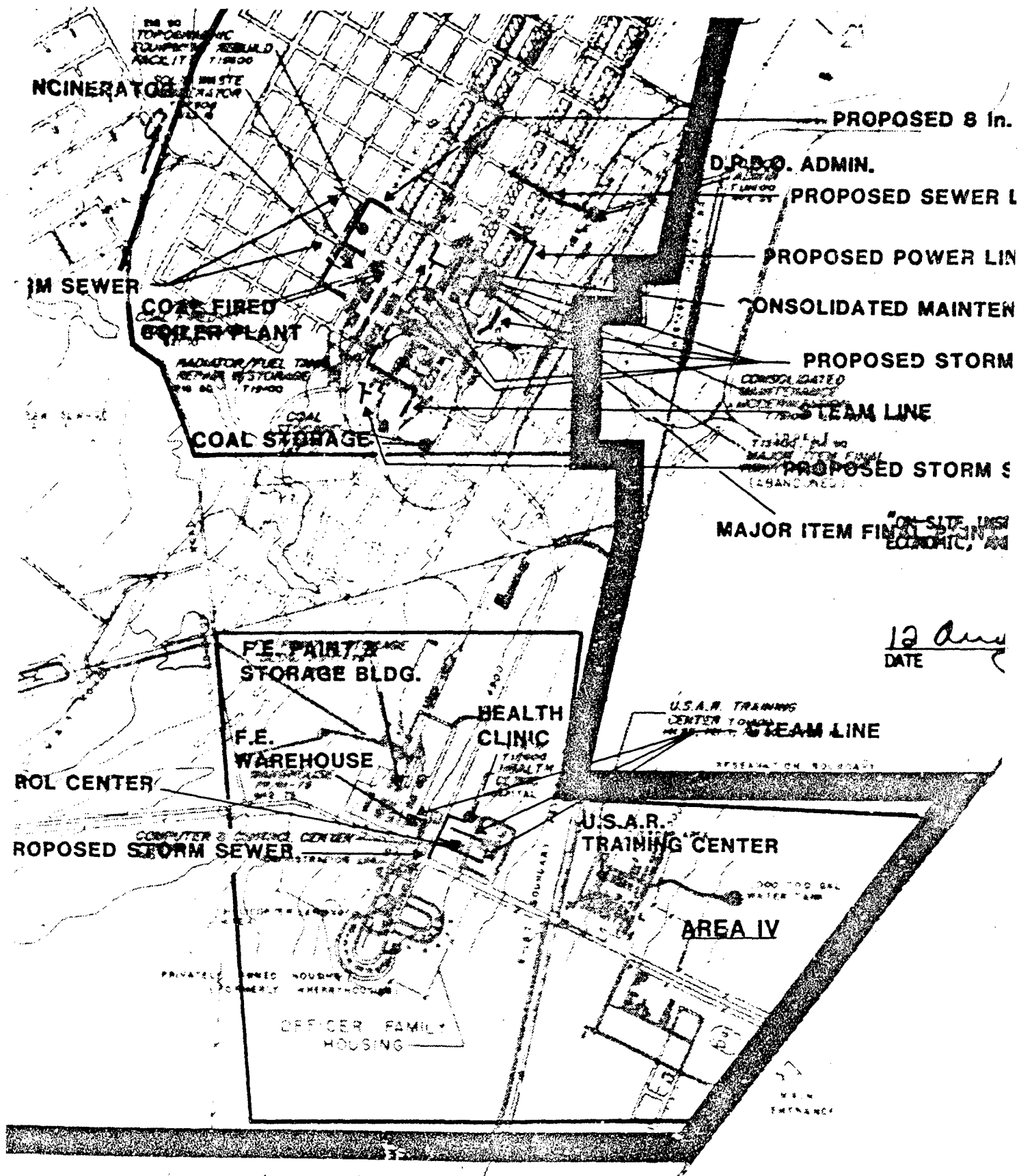


RESERVA



RESEMP. AT. ON. B. U. R. C. A. T.





PROPOSED 8 IN. WATER LINE

PROPOSED 8 In. WATER LINE

D.P.D.O. ADMIN.

PROPOSED SEWER LINE

PROPOSED POWER LINE (ELEVATED)

CONSOLIDATED MAINTENANCE MODERNIZATION

PROPOSED STORM SEWER

STEAM LINE

PROPOSED STORM SEWER

ON-SITE INSPECTION HAS BEEN COMPLETED FOR ENVIRONMENTAL, HISTORICAL, ECONOMIC, AND OPERATIONAL CONSIDERATIONS FOR EACH PROPOSED ITEM.

12 Aug 1982
DATE

Dennis E. Bingham
DENNIS E. BINGHAM
CHIEF, FACILITIES ENGINEERING DIVISION

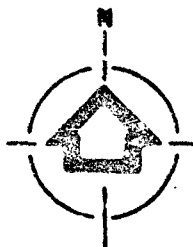
4. R. TRASHES
FEED TO CHURN
STEAM LINE

CENTER

AREA IV

NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN.



9100 S-

10400 S-

11700 S-

13000 S-

14300 S-

15600 S-

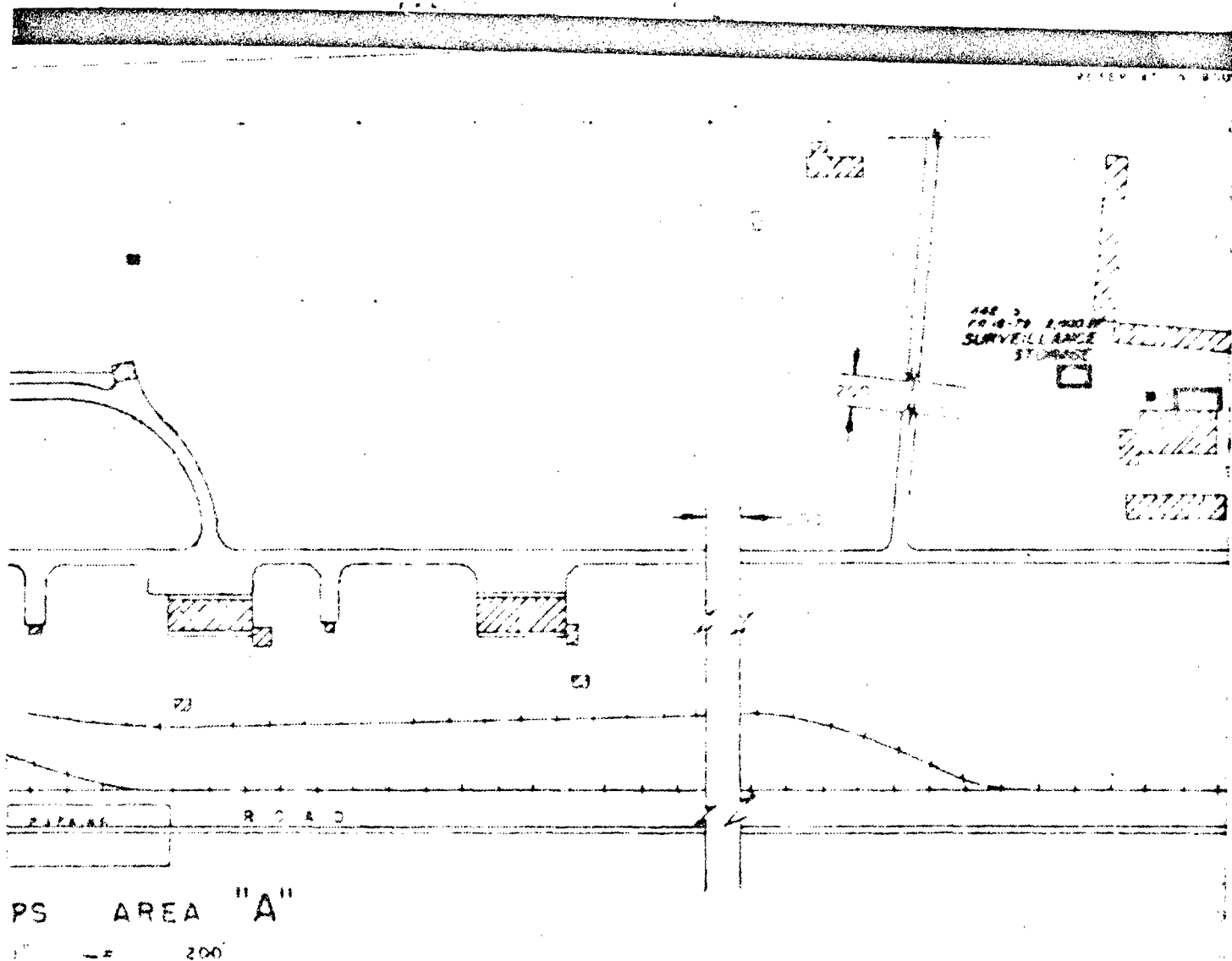
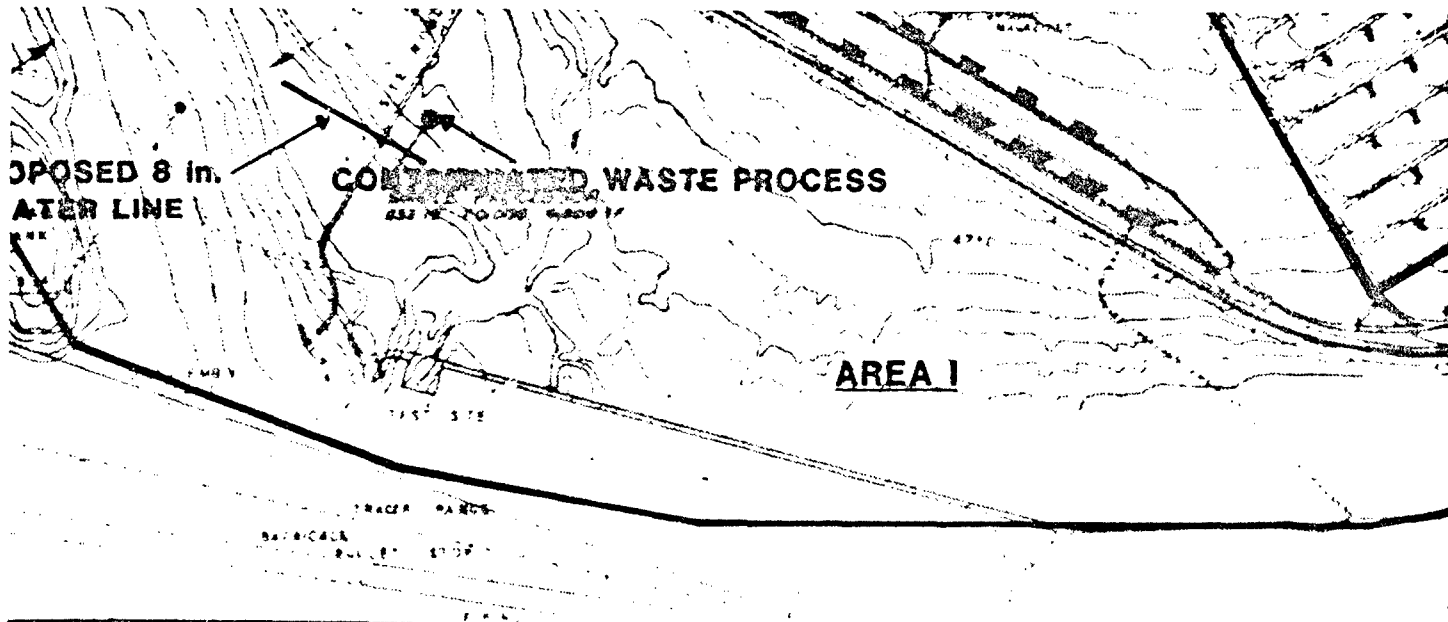
"B"
AMMUNITION MAINTENANCE FACILITY
SCALE

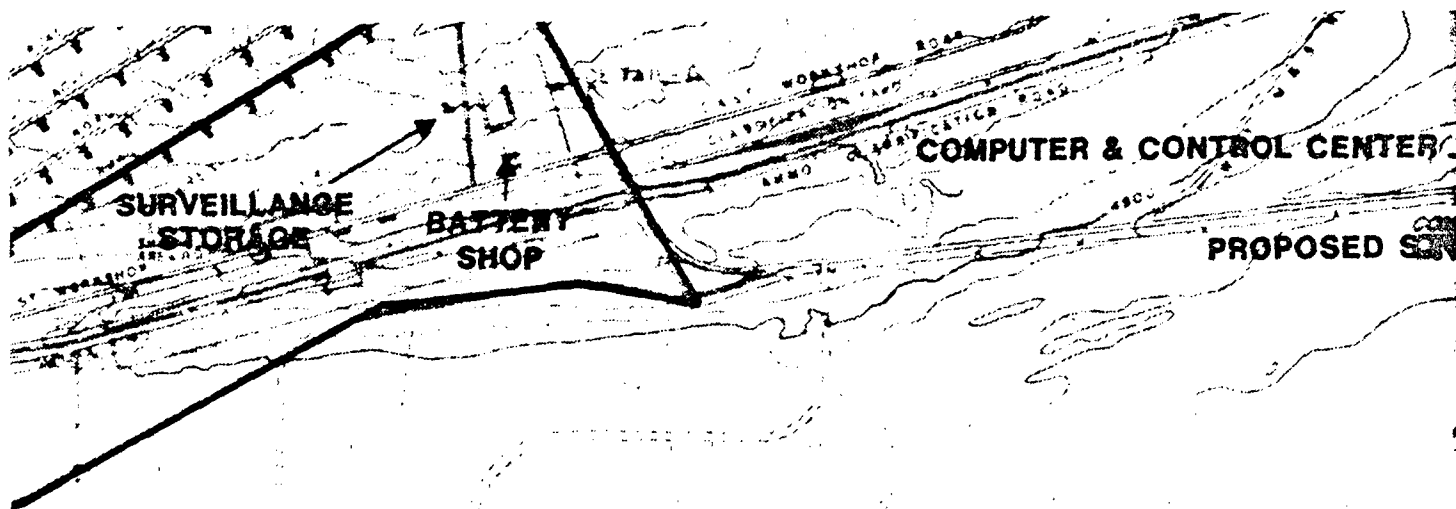
DEMILITARIZATION
FACILITY
DEPT. C

NOTE: THE CHEMICAL RANGE IS NOT
BEING USED DUE TO THE
FIRING RANGS EXTENDING OFF
DEPT. ALL FIRING OF
CHEMICALS ARE DONE AT
PUEBLO DEPT. ACTIVITY

NEW AL
RANGE

ENLARGED AMMUNITION WORKSH





LEGEND

EXISTING	PROPOSED	PLAN	
			BUILDINGS, PERMANENT
			BUILDINGS, SEMI-PERMANENT
			BUILDINGS, TEMPORARY
			ROADS & PARKING
			TRAIL OR EARTH ROAD
			RAILROAD
			FENCE
			RETERATION BOUNDARY
			INDEX CONTOUR
			INTERMEDIATE CONTOUR

ATTENTION
VOP
8-20
1-14-79
200-22

TRAINING
TOOEE
STEAM LINE

RESERVATION ON 30' ROAD

ENTER

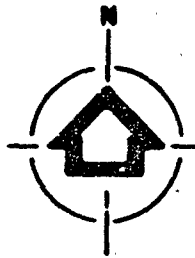
1000 1000 GAL
WATER TANK

IEA IV

ENTRANCE

NOTE:

1. NO FLOOD HAZARD EXISTS.
2. HISTORICAL SITE AS SHOWN.



SCALE IN FEET

CONTOUR INTERVAL 20 FEET

TOOELE ARMY DEPOT

TOOELE, UTAH

ROBERT G. MUIR & ASSOCIATES
ARCHITECTS & PLANNERS
COLORADO SPRINGS, COLORADO 80903

U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA 95814

MASTER PLAN
PLANS FOR FUTURE DEVELOPMENT

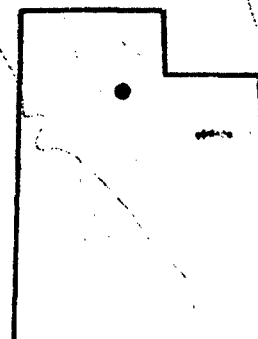
GENERAL SITE PLAN

<p>DATE: 1982</p> <p>BY: [Signature]</p> <p>NO. 15</p>		DATE	DRAWING NO.
		SEPT 1982	18-04-01
<p>4 of 28</p>		DATE	FILE NO.

TOOELE ARMY DEPOT

SOUTH POST

**Figure 6-2 LOCATIONS
OF
ON-GOING AND PLANNED ACTIVITIES**



UTAH MAP LOCATOR
SALT LAKE CITY

8 48 700

8 47 700

8 46 700

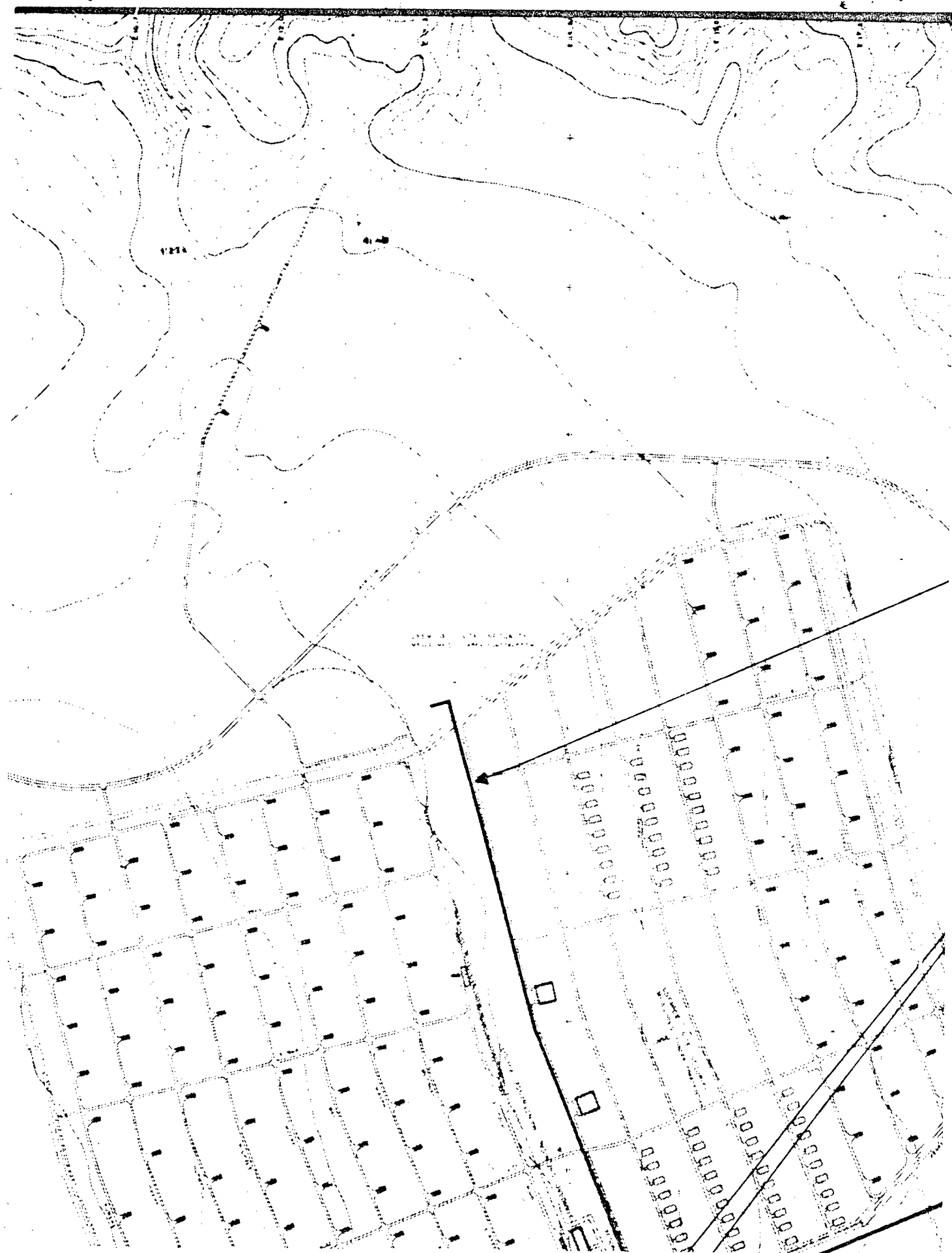
8 45 700

8 44 700

8 43 700

8 42 700

8 41 700



A topographic map showing contour lines and various utility lines. A thick black line runs horizontally across the top. A dashed line runs vertically on the right side. A solid line runs diagonally from the bottom left towards the center. Three labels with arrows point to specific lines: 'ELECTRICAL LINE' points to a dashed line, 'PROPOSED SEWER LINE' points to a solid line, and 'PROPOSED WATER PIPE 8"' points to another solid line. The map also shows some faint text and numbers, possibly indicating elevation or coordinates.

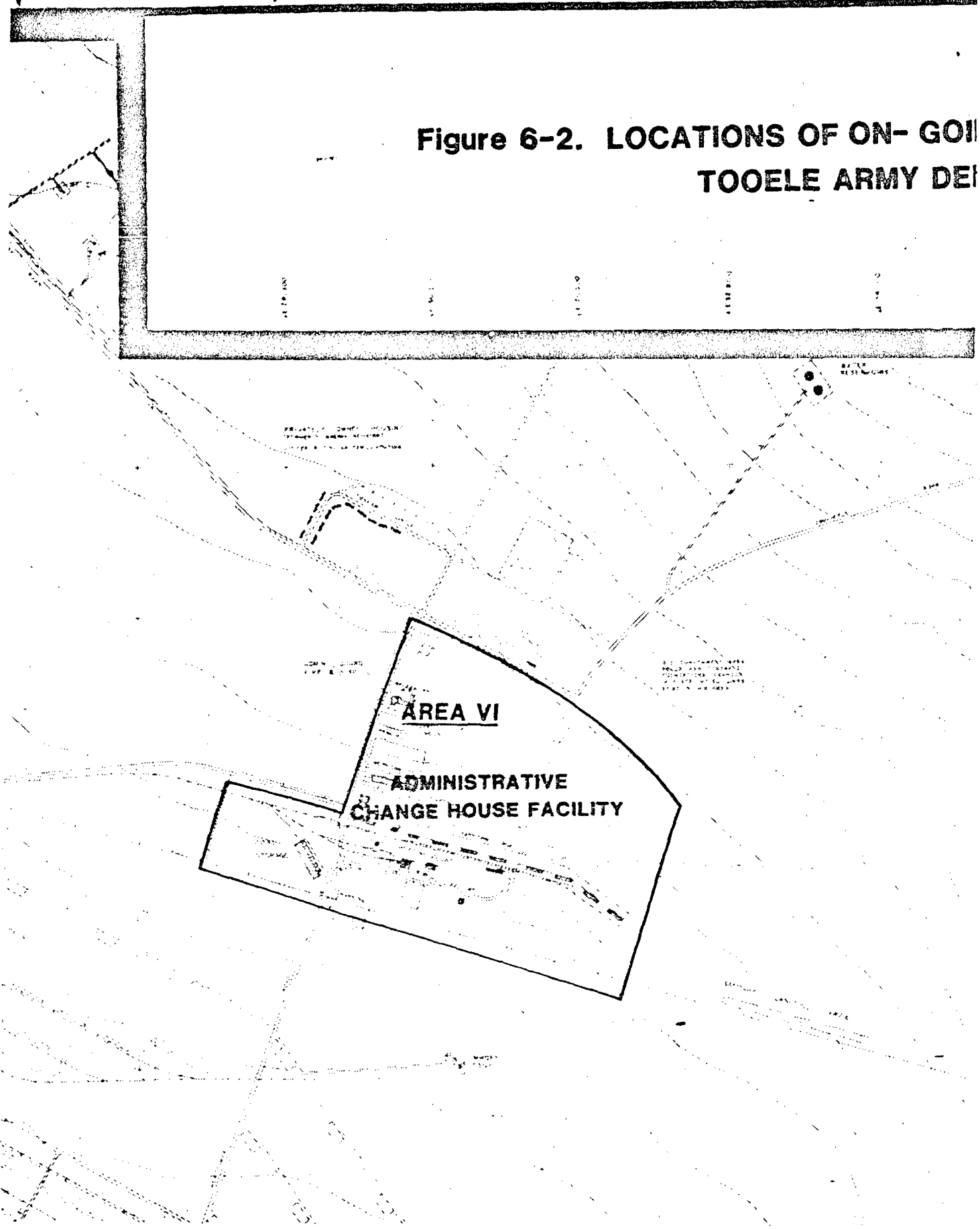
ELECTRICAL LINE

PROPOSED SEWER LINE

PROPOSED WATER PIPE 8"

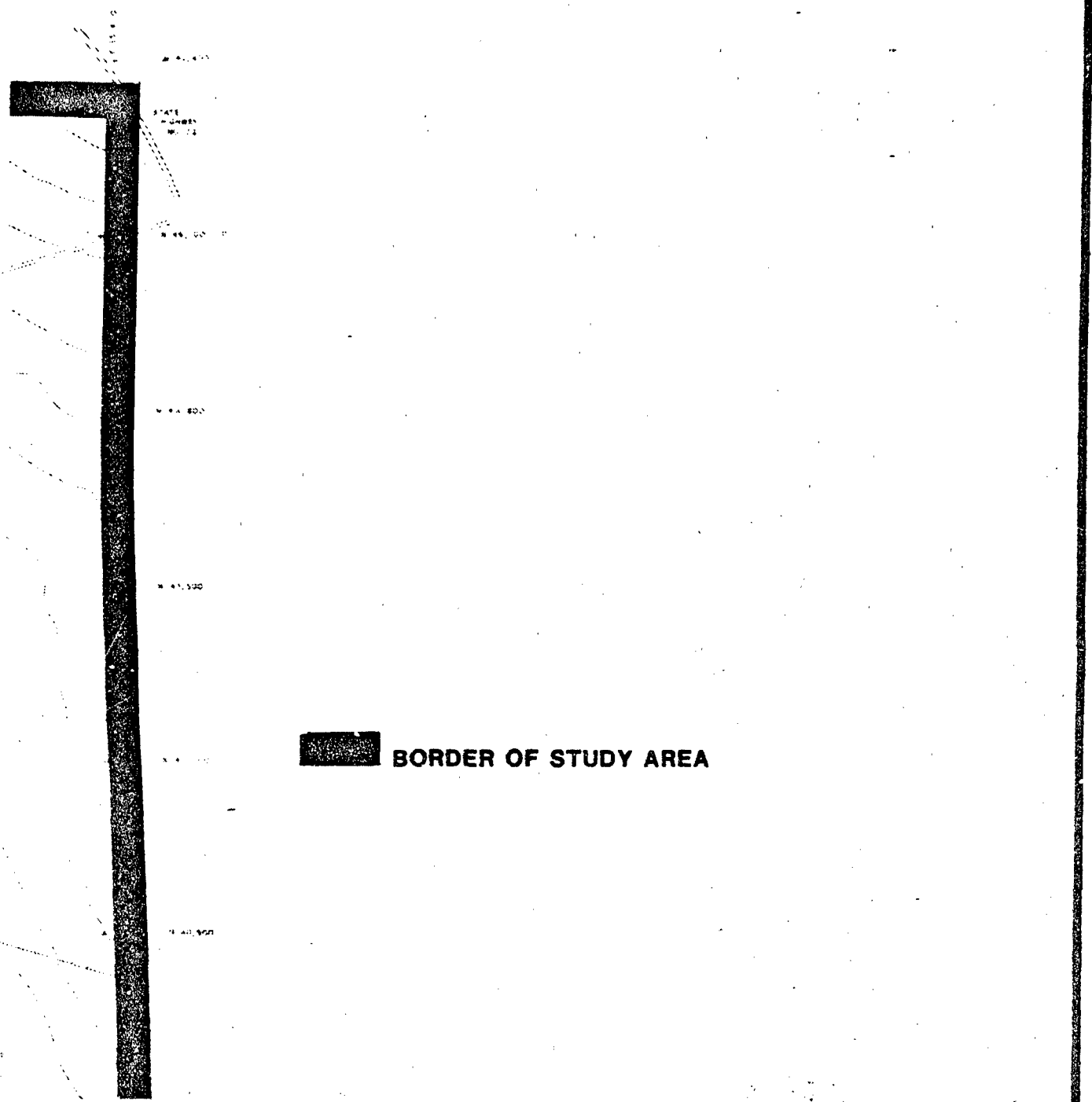
4

**Figure 6-2. LOCATIONS OF ON- GOING
TOOELE ARMY DE**



5

GOING AND PLANNED ACTIVITIES DEPOT - SOUTH FOST



 **BORDER OF STUDY AREA**

1940

6

1941

1942

1943

1944

1945

1946

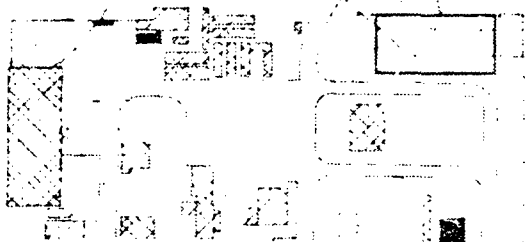
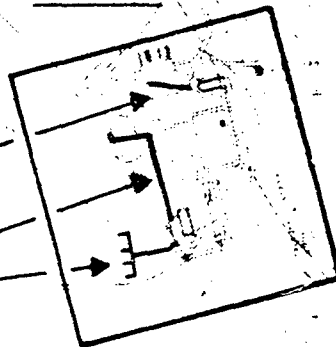
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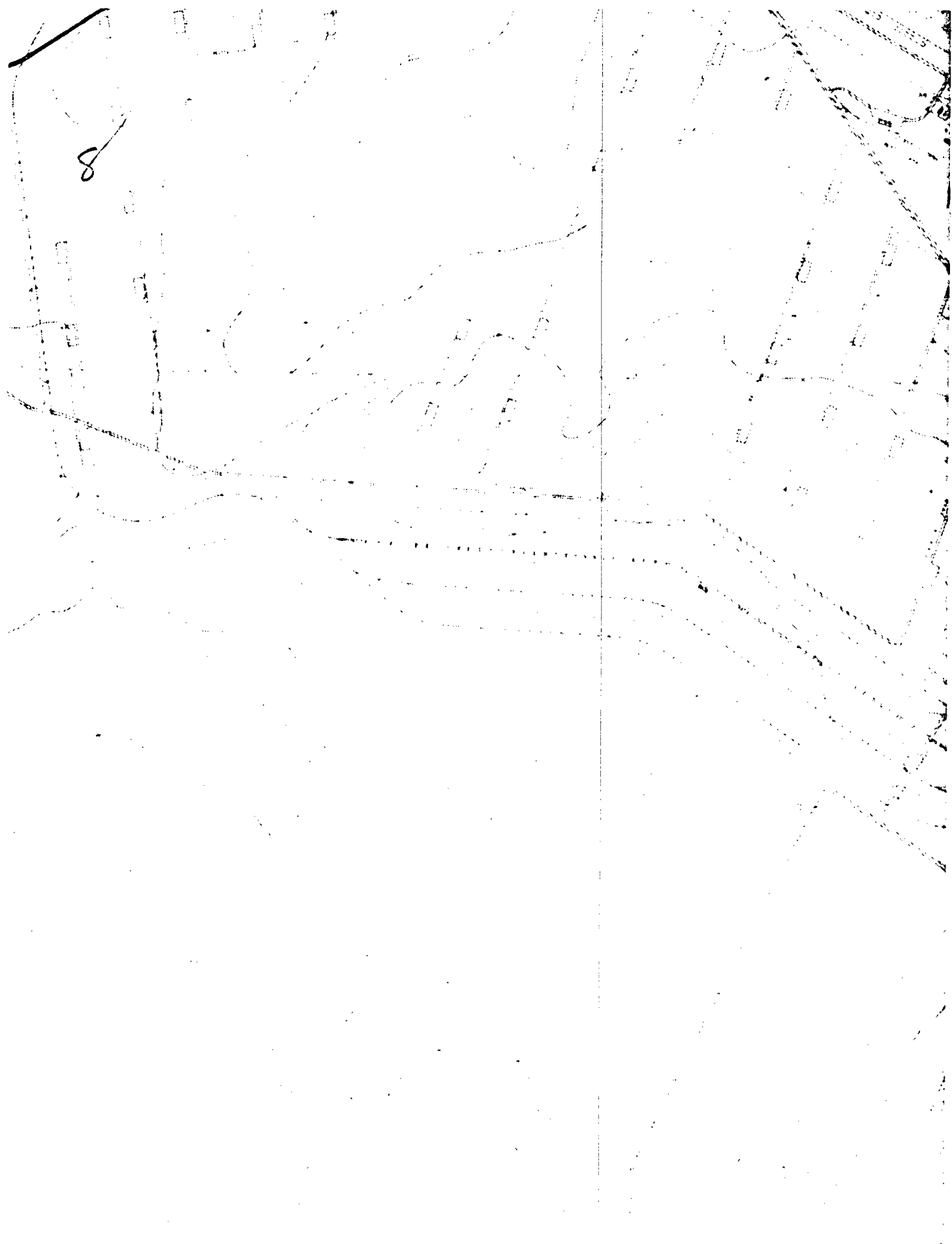
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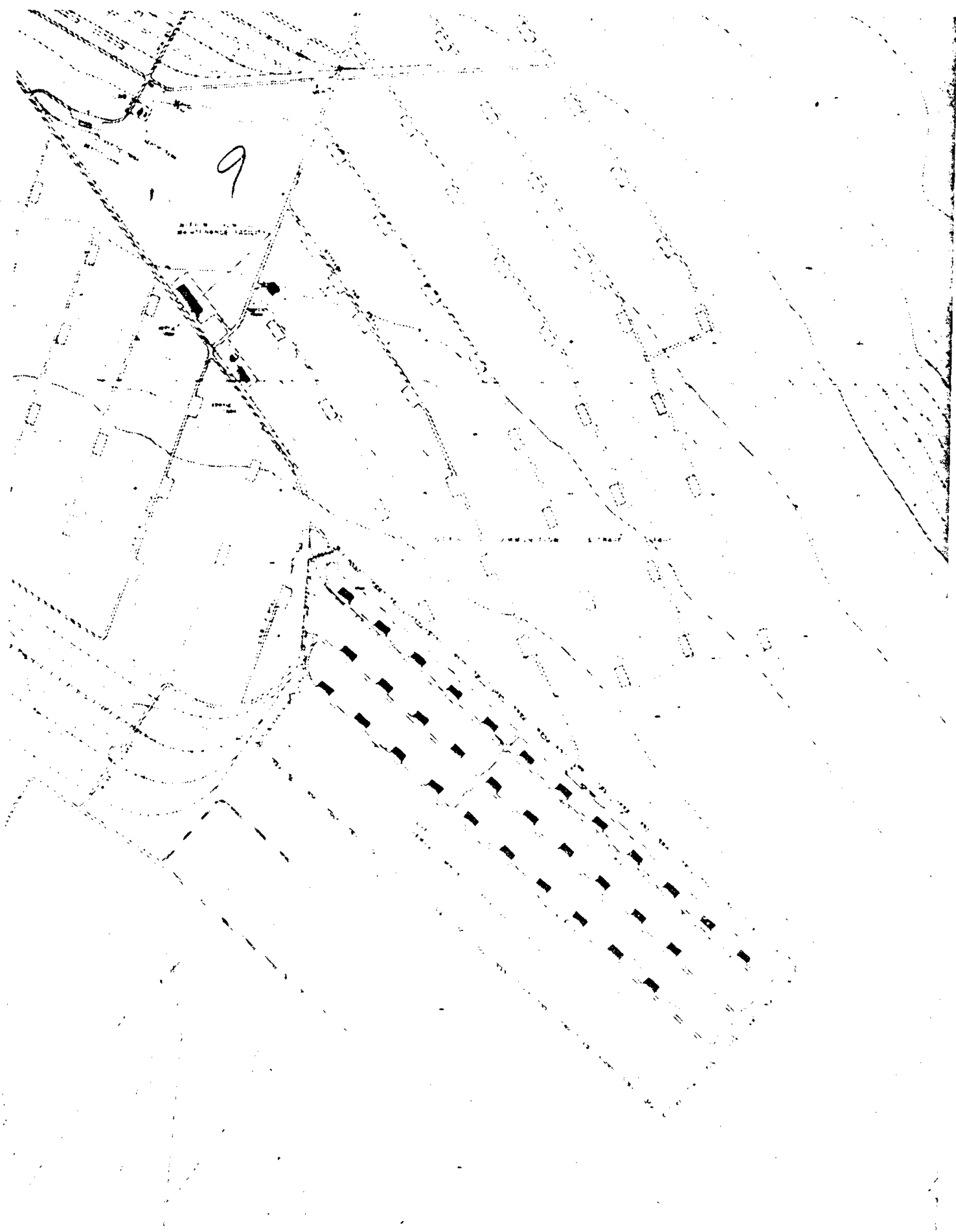
ELECTRICAL LINE

7

AREA V







10

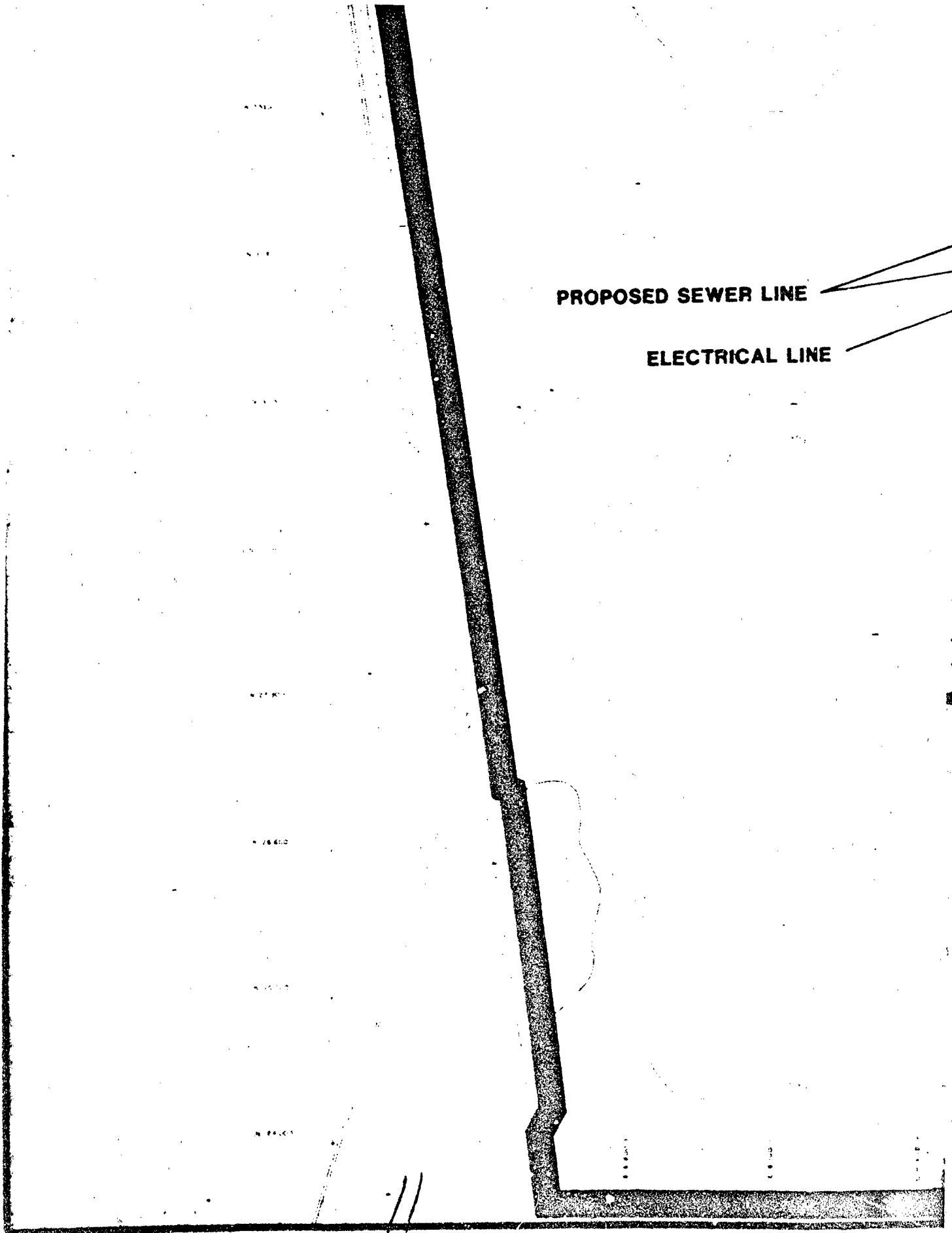
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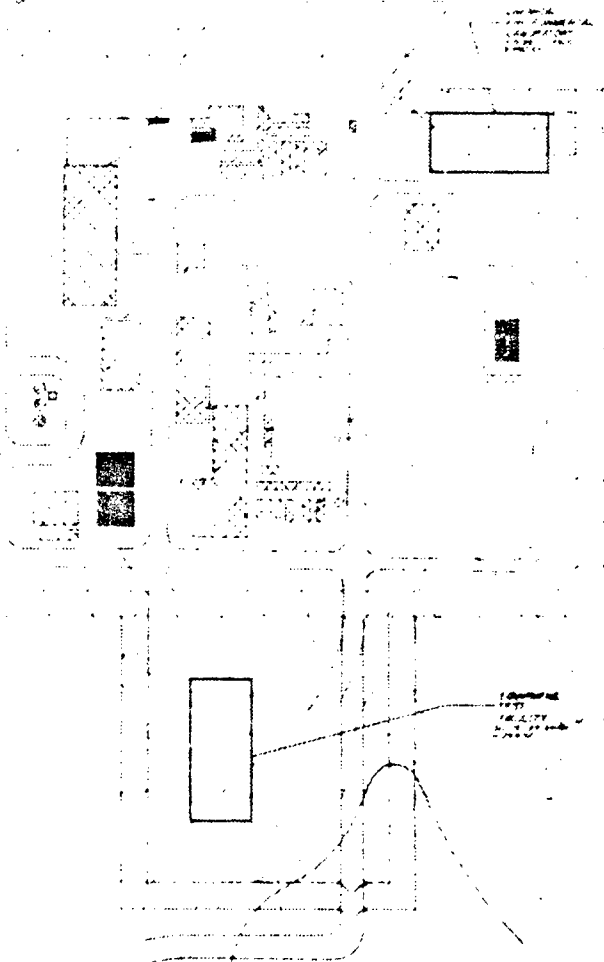
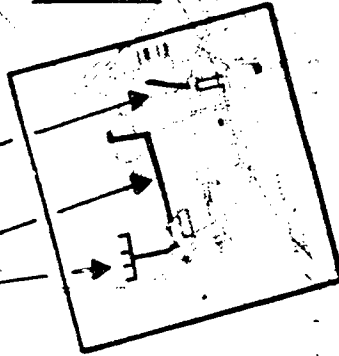
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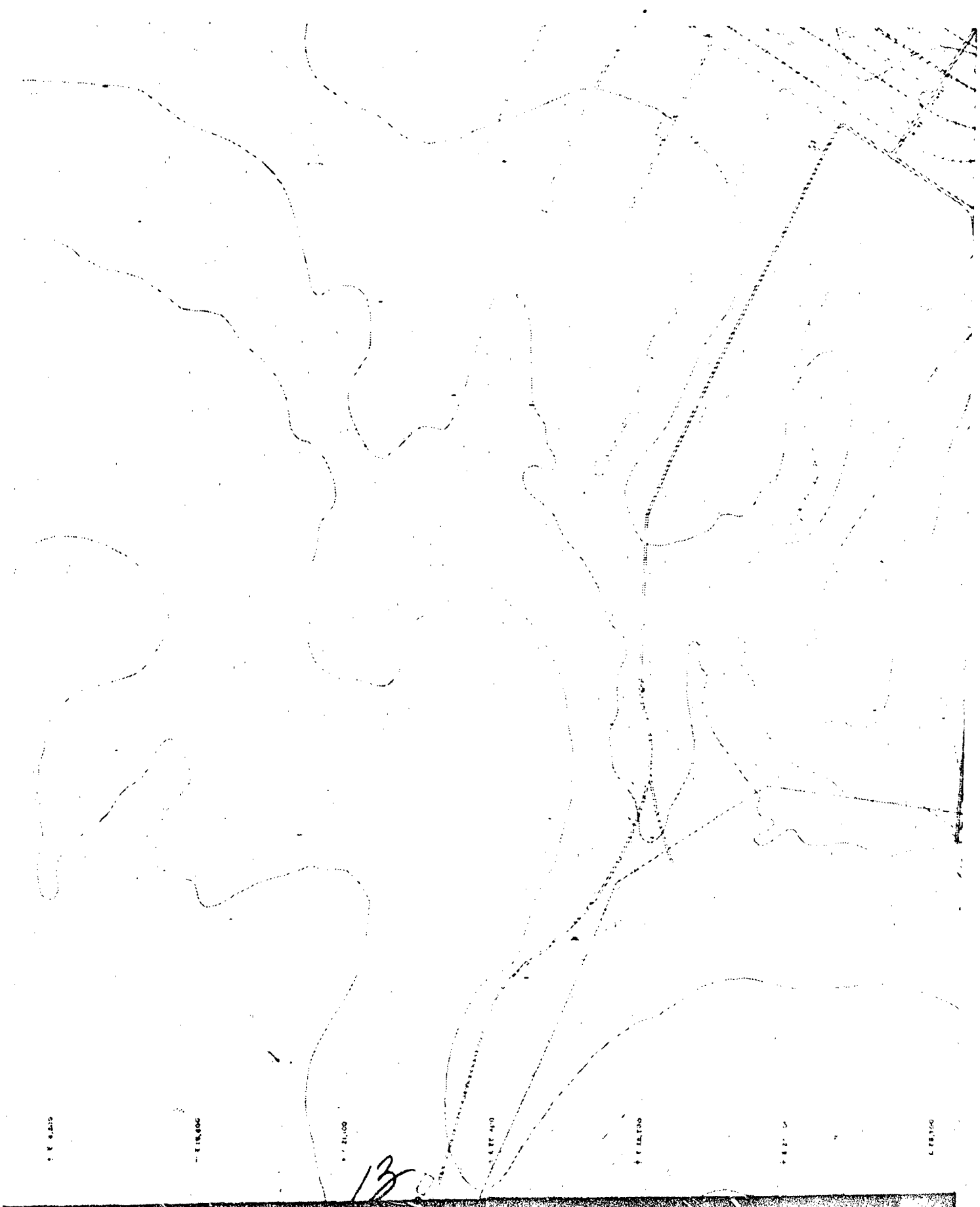
PROPOSED SEWER LINE

ELECTRICAL LINE



AREA V





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13

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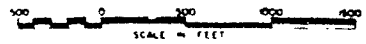
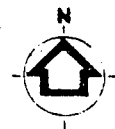
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
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	PERMANENT		PERMANENT
	PERMANENT		PERMANENT
	PERMANENT		PERMANENT
	PERMANENT		PERMANENT
	PERMANENT		PERMANENT
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	PERMANENT		PERMANENT
	PERMANENT		PERMANENT
	PERMANENT		PERMANENT
	PERMANENT		PERMANENT
	PERMANENT		PERMANENT

ON-SITE INSPECTION HAS BEEN COMPLETED FOR ENVIRONMENTAL, HISTORICAL, ECONOMIC, AND OPERATIONAL CONSIDERATIONS FOR EACH PROPOSED ITEM.

Dennis E. Bracken
 DENNIS E. BRACKEN
 Chief, Depot Facilities Division

NOTE
 1. THIS AREA IS NOT LOCATED IN ANY KNOWN FLOOD PLAIN.
 2. NO HISTORICAL PLACES NOTED ON THIS SHEET



TOOELE ARMY DEPOT

OFFICE OF THE FACILITIES ENGINEER
 TOOELE ARMY DEPOT
 TOOELE, UTAH

MASTER PLAN FUTURE DEVELOPMENT PLANS GENERAL SITE PLAN

AREA 5

APPROVED BY THE OFFICIAL AUTHORITY DATE: 11-04-02 BY: [Signature] TITLE: [Title]		CHECKED BY DATE: 11-04-02 BY: [Signature] TITLE: [Title]
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15

Table 6-1. A SUMMARY OF ON GOING AND PLANNED ACTIVITIES ON THE TOUELE ARMY DEPOT THAT COULD AFFECT ARCHEOLOGICAL RESOURCES

Description	Date	Area (a)	Size Sq/Ft.	Estimated Ratio of		Total Impact (c)	Recommen- dation Survey or Monitor (d)	Resource Class (e)	Resource Known or Predicted (f)	NRHP Status (g)	Other Value (h)	Direct (i)	Indirect (j)	Mitiga- tion Options
				Depth Below Surface (ft.)	To Total Disturbed Area (b)									
North Post														
Ammunition Surveillance Workshop	No Date	1	21,165	10 ft.	3:5	12.9	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeological Data Recovery
Ammo Handling Building	No Date	1	15,360	6 ft.	3:5	12.1	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeological Data Recovery
Contaminated Waste Products	No Date	1	4,800	10 ft.	2:5	10.3	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeological Data Recovery
Surveillance Storage Products	No Date	1	2,400	6 ft.	2:5	9.7	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeological Data Recovery
Battery Shop Products	No Date	1	2,000	6 ft.	2:5	9.5	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeological Data Recovery
Consolidated Red Eye	No Date	1	3,980	10 ft.	2:5	10.1	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeological Data Recovery

Table 6-1. A SUMMARY OF ONGOING AND PLANNED ACTIVITIES ON THE TUELE ARMY DEPOT THAT COULD AFFECT ARCHEOLOGICAL RESOURCES (Continued)

Description	Date	Area (a)	Size Sq/Ft.	Estimated Ratio of		Total Acres Impact (c)	Recommen- dation Survey or Monitor (d)	Resource Class (e)	Resource Known or Predicted (f)	NRIP Status (g)	Other Value (h)	Direct (i)	Indirect (j)	Mitiga- tion Options
				Depth Below Surface (ft.)	Disturbed Area (b)									
North Post (Continued)														
Rifle Range Extension	No Date	II	8,100	2-6 ft.	2:5	10.9	S	Paleo Archaic Fremont Numic Historic	L L L++ L L	INSF	N/A	Destroy Resource	Area More Accessi- ble to Steward's house pits	Archeol- ogical Data Recovery
Open Coal Storage	No Date	III	120,600	2-6 ft.	3:5	20.5	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
Open Storage Lot	No Date	III	270,000	10 ft.	3:5	28.9	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
Solid Waste Incinerator	No Date	III	37,600	10-12 ft.	3:5	14.5	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
Consolidated Maintenance Moderniza- tion	No Date	III	300,000	6 ft.	N/A	30.3	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery

Table b-1. A SUMMARY OF ON GOING AND PLANNED ACTIVITIES ON THE TOOLE ARMY DEPOT THAT COULD AFFECT ARCHEOLOGICAL RESOURCES (Continued)

Description	Date	Area (a)	Size Sq/Ft.	Estimated Ratio of		Total Acreeage Impact (c)	Recommen- dation Survey or Monitor (d)	Resource		NRHP Status (g)	Other Value (h)	Direct (i)	Indirect (j)	Mitiga- tion Options
				Depth Below Surface (ft.)	Disturbed To Total Area (b)			Class (e)	Known or Predicted (f)					
North Post (Continued)														
Paint Facility	No Date	III	43,200	2-6 ft.	N/A	15.0	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
Supply Distribution Center	No Date	III	306,500	2-6 ft.	N/A	30.3	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
Defense Property Disposal Office (WHD) (Replace Existing)	No Date	III	4,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
South Post														
USA Reserve Training Field Officer Barracks	No Date	IV	2,375	2-6 ft.	2:5	9.6	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
F.E. Warehouse and Storage Shed	No Date	III	6,600	2-6 ft.	2:5	10.6	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery

Table 6-1. A SUMMARY OF ON GOING AND PLANNED ACTIVITIES ON THE TUCULE ARMY DEPOT THAT COULD AFFECT ARCHEOLOGICAL RESOURCES (Continued)

Description	Date	Area (a)	Size Sq/Ft.	Estimated Ratio of		Total Acreeage Impact (c)	Recommen- dation Survey or Monitor (d)	Resource		NRIP Status (g)	Other Value (h)	Direct (i)	Indirect (j)	Mitiga- tion Options
				Depth Below Surface (ft.)	To Total Area (b)			Resource Class (e)	Known or Predicted (f)					
South Post (Continued)														
Jr. N. Co. Barracks	No Date	IV												
			5,910	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			6,930	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
88 mm			7,620	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Health Clinic	No Date	IV	9,610	6 ft.	2:5	11.2	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
F.E. Paint and Storage Building	No Date	IV												
			5,000	2-6 ft.	2:5	10.3	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
Command and Computer Center	No Date	IV	114,346	6 ft.	3:5	20.7	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
Chemical Environ- mental Lab Replacement	No Date	V												
			9,900	6 ft.	2:5	11.3	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery

Table 6-1. A SUMMARY OF ON GOING AND PLANNED ACTIVITIES ON THE TOUELE ARMY DEPOT THAT COULD AFFECT ARCHEOLOGICAL RESOURCES (Continued)

Description	Date	Area (a)	Size Sq/Ft.	Estimated Ratio of Depth Disturbed Below Surface (ft.)	Total Area (b)	Total Impact (c)	Recommen- dation Survey or Monitor (d)	Resource Class (e)	Resource Known or Predicted (f)	NRIP Status (g)	Other Value (h)	Direct (i)	Indirect (j)	Mitiga- tion Options
South Post (Continued)														
Change House No Facility		VI	3,000	6 ft.	2:5	9.8	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	N/A	Destroy Resource	N/A	Archeol- ogical Data Recovery
Both Facilities														
Utilities No and Ground Date			Unknown											
Improve- ments, Mod- ifications, and Extension to Existing Facilities														

- (a) Locations of these areas are mapped in Figure 6-1 and 6-2.
- (b) Not all the ground within the boundaries of an on-going or proposed activity area will necessarily be affected. This ratio is an evaluation of the acres of surface projected to be disturbed within a proposed activity area in proportion to the overall size of the area itself.
- (c) Total acreage estimates are based on a 300 foot perimeter added to the proposed construction/modification activity.
- (d) Survey (S), Monitor (M), or Not Applicable (N/A).
- (e) This is a synthetic statement of temporal unit plus thematic unit plus resource type, as presented in Table 5-1.
- (f) This is an identification of the known (K) or potential (P) resources that are located within the proposed activity area, as well as the positive (+) chance that presently unknown resources are likely (L) to be found there.
- (g) The National Register of Historic Places (NRHP) status of the resource is identified by the following code. INSF = Insufficient information available by which to make a judgement.
- (h) Other values may include concerns such as traditional Native American religious significance, local zoning requirements, Not Applicable (N/A).
- (i) Direct impacts are those whose ground-disturbing activities will directly damage or destroy the identified resource, Not Applicable (N/A).
- (j) Indirect impacts include activities such as vandalism because of increased knowledge of a resource, increased erosion of a resource because of projected-related activities (e.g., loss of vegetative cover), or loss of structural integrity of surface or buried structural elements because of increased traffic vibration, Not Applicable (N/A).

6.1.2 Proposed Activities - South Post

A change house facility is planned for Area VI in the South Post (Figure 6-2). The building will be located along Allhouse Road between Rakin and Reynolds roads. The construction of a new chemical and environmental assessment laboratory is to be located in Area V in the Chemical Agent Munitions Disposal System (CAMDS) compound. It will replace an existing substandard facility and improve the overall efficiency of this operation. Some modifications and extensions to existing utilities will be necessary to provide service to the proposed construction.

6.2 APPROPRIATE ARCHEOLOGICAL MANAGEMENT GOALS WITHIN TOOELE NORTH AND SOUTH ARMY POST DEPOT

This section presents appropriate and efficient cultural resource management objectives for Tooele Army Depot. The basis of management objectives are the installations' long-range planning needs and the specific short-term needs based on projected land-disturbing activities.

6.2.1 General Facility Planning

The Draft Army Regulations, (AR 420.XX), prescribes Army policy, procedures, and responsibilities for compliance with the National Historic Preservation Act (NHPA), for maintaining state-of-the-art standards for preservation personnel and projects, and for the timely implementation of a historic preservation program. The AR.420.XX requires that each U.S. Army Materiel Development and Readiness Command (DARCOM) installation develop and implement a Historic Preservation Plan (HPP).

Following are the objectives of the DARCOM HPP:

- Integration of historic preservation requirements with military needs, construction activities, and real property and land use decisions.
- Provide cultural resources data for the installation information system.
- Provide guidelines for the management of historic properties.
- Prioritize the acquisition of additional information to determine if there may be additional cultural properties not yet located or identified.
- Prioritize installation undertakings by their potential effect on historic properties.

Criteria for determining the necessity of developing a plan are based on evidence of known cultural properties that may be eligible for inclusion on the National Register (NRHP). Because there are two potentially significant archeological properties on Tooele North and an historic property on Tooele South, the installation meets the criteria and should develop a HPP. The information provided in this report will provide the basis from which the Plan may be developed and implemented.

The identification procedure has been initiated by the completion of this overview and recommended management plan and with the identification of Rocky Ridge petroglyph and Fremont house mounds. This needs to be followed by a complete identification and evaluation program, an extensive oral and archival review, field surface and subsurface inventory (especially in the house mound area) on all accessible undisturbed Depot land, and an evaluation of resource significance by the criteria established in 36 CFR 60.6. The HPP would be the basis for developing a Memorandum of Agreement (MOA) with the Advisory Council on Historic Preservation (ACHP). Proposed ground-disturbing activities would require either monitoring during construction or a field survey prior to construction. Intensive field surveys could be postponed until there are specific ground disturbing projects, or if sale, lease, or trade of the buffer and grazing zones are considered.

Under any schedule, until known archeological properties have been determined not to be significant, they must be treated as if they are significant for compliance with the NHPA. NHPA states, that, "Each Federal agency shall exercise caution to assure that any such property that might qualify for inclusion is not inadvertently transferred, sold, demolished, substantially altered, or allowed to deteriorate significantly." It is recommended that the two known archeological properties be professionally evaluated for significance and be managed in the interim as if they were eligible for the National Register of Historic Places (NRHP). It is further recommended that these sites be avoided by any Army activities and the area restricted to prevent further vandalism.

The recommended next stage in the assessment of the importance of historic facilities and historic archeological properties is an extensive review of archival materials and analysis of regional historic research objectives. The archival review would include information contained in Tooele County land records, county libraries, the National Archives and Records Service, Bureau of Land Management (BLM) records, as well as other pertinent local documents and interviews with pre-1940 residents in and around the Army Depot property. The review should include consultation with the Utah State Historic Preservation Officer (SHPO) in order to determine if known historic and archeologic properties on the installation will answer specific regional research questions.

Executive Order 11593 and Section 110(a)(2) of the National Historic Preservation Act (NHPA), as amended, require that each federal agency establish a program to locate and nominate to the Secretary of the Interior all cultural properties under its control or ownership, that appear to qualify for inclusion on the NRHP. The identification stage of the recommended archeological management plan consists of a field surface survey and subsurface evaluation to locate archeological properties and to determine their integrity and boundary extent and subsurface potential. Rather than require a 100 percent survey as the legislation implies, the current federal policy for implementing this requirement states that there should be a reasonable program consistent with schedules, budget, and multiple objectives of the land managing agency. Due to the sensitive nature of the installation and extensive ground disturbance, surveys to locate eligible culture resources on any areas other than the buffer and grazing areas is not recommended or advised. The buffer and grazing areas have been maintained

) and protected by the Army as essentially non-use areas which extend along the Depot's periphery. Their primary purpose is to provide open buffers from the munitions storage areas. While no ground disturbing activities are proposed for these areas, it would be most cost-effective to complete a professional archeological inventory for future installation management needs.

Based on the historic research and field inventory information, all identified sites, including the Fremont village site and Rocky Ridge petroglyph, should be evaluated for inclusion in the NRHP by the criteria set forth in 36 CFR 60.6 and by the research objectives of the Utah SHPO. If sites are determined to be significant, a long-term management plan should be incorporated in the installation's property management plan. Management considerations may include preservation and conservation with an annual field review of site condition or scientific investigation of sites to answer important research questions and to fill in research gaps.

The HPP containing the information in this report would constitute the basis for a preliminary case report required for a MOA with the ACHP. Procedures are outline in 36 CFR 800.6(c). The Utah SHPO should be consulted and his written concurrence included in the ACHP request. A ratified MOA would constitute comments of the Council and complete the Army's compliance responsibilities under Section 106 of the National Historic Preservation Act (NHPA). The MOA reduces timely and often costly delays in compliance procedures that occur when significant cultural properties may be affected on a project by project basis.

) It is further recommended that an individual be appointed who will be responsible for all historic preservation planning and who will act as the Army liaison between the SHPO and ACHP. It is recommended that the installation Preservation Officer provide the Utah SHPO and the ACHP an opportunity to review the installation's HPP. The plan should include information on any on-going activities or any special projects that may adversely affect any eligible properties. Alternatives should be developed that will reduce or mitigate any adverse effect.

However, if, after consultation with the SHPO, none of the identified sites are eligible, the installation should obtain a letter of agreement from the SHPO. With this correspondence and supporting documentation, the facility's historic preservation compliance responsibilities are completed.

6.2.2 Tooele Army Depot Project-Specific Resource Protection or Treatment Options

The following project-specific management program is based on the planned ground-disturbing activities to the year 1990 and their potential to affect significant cultural properties. The proposed sewer and water lines, DPDO, and three barracks are in heavily disturbed areas (Figure 6-1 and 6-2). There remains the potential for subsurface prehistoric and historic material to be present in these areas. Therefore, a professional archeologist should be retained to monitor these projects on-site during ground disturbance.

New proposed construction activities that may directly affect archeological properties are the ammunition surveillance workshop, additional maintenance and production facilities, the new clinic, three new

administration buildings, one barracks, the solid waste incinerator, the boiler, and storage tank. The construction activities will affect 100 percent of the ground surface and may directly impact and destroy unknown archeological properties. These areas should be surveyed before construction to inventory and evaluate any archeological, historical, or architectural properties within 300 ft. of the proposed construction.

If eligible cultural properties are found, plans should be developed in consultation with the SHPO and ACHP to avoid or mitigate possible adverse effects. Avoiding significant resources, if possible, is generally the most cost-effective and efficient management tool. Construction designs can be altered to conserve the resources, or resources can be protected by fencing or posting areas. For significant properties that will be adversely affected by Army activities, mitigation of the effect would be a program to collect data that would answer specific research questions. With a HPP approved in advance by the SHPO and ACHP, possible time delays in the consultation process could be avoided.

While no ground-disturbing activities are planned for the buffer and grazing areas, there are two known potentially significant archeological sites in these areas on the North Post. It is recommended that an intensive field survey be conducted by a professional archeologist to identify unknown, potentially significant properties. The Army would then be in compliance with Executive Order 11593 and Section 110 of the National Historic Preservation Act (NHPA).

Fremont Village Site (Tooele Army Depot North). On examining previous ground disturbances in the north buffer area where Steward's Fremont Village sites #3,4,5,6, and 9 are known to exist, several factors appear to have affected the site's integrity and significance: 1) Steward (1933:9) reported that at one time there were probably 200 pit houses. "All but a few have been destroyed by marauders." 2) Steward excavated several of the pit houses; if the excavation was complete, no further information exists. 3) The entire county was heavily eroded in the 1930's and later revegetated. 4) Stream channels had their courses changed during the heavy rains and flooding in May 1983 and, undoubtedly, before then. A 6 foot wide trench was cut at the fence line by flooding (personal communication, Robert Marshall), and there are distinct elevation differences between the USGS topographic maps of 1955 and the Army topography map of 1982. Since the establishment of the installation, sites #3, 4, 5, 6, and 9 have been protected. During the research team's site visit and cursory survey of the area, several lithic tools and pottery sheds were identified. With this evidence of human occupation surviving the above effects, it is unknown what condition these sites are in and whether there is any site integrity or research value remaining.

Efforts should be made to determine the extent and amount of destruction by environmental factors and previous excavation through cost-effective methods such as augering, magnetometry, resistivity, or aerial photo interpretation. Augering would determine if a subsurface material exists. Magnetometers are useful for providing indications of the location of certain cultural features such as fire pits, pits or ditches filled with soils or materials differing from those in the immediate surrounding area. Resistivity equipment is useful for detailing the size, depth, and outline

of large buried features which are known to exist, such as the Fremont pit houses. Aerial photo interpretation in the early spring at the inception of vegetation growth would determine the moisture content in terms of differential vegetation growth reflecting subsurface disturbance.

Through one or more of these methods, it can be determined cost-effectively whether the Steward's excavation in 1930 was total data recovery, if environmental factors affected the site, or if the resource still contains important information to answer research questions. If the latter is true, the site may prove to be significant and eligible to the NRHP, and the Army should avoid activities that would impact the resource. If after testing, it is shown that all important data have been collected during the 1930 excavation or if the site has been adversely affected by environmental factors, the site is not eligible to the NRHP and deserves no further consideration.

Because the Army has no plans to impact the area of the Fremont Village Site, the most appropriate and cost-effective goal consistent with the Master Plan would be to protect and preserve the site. When a resource is selected for preservation, a management program that minimizes deterioration or destruction of the scientific, cultural, and associated values is required. Preservation, including avoidance by any Army ground disturbing activities and restricted access with annual monitoring of the area to prevent vandalism, is recommended as the preferred management procedure for the Fremont Village site.

Rocky Ridge Petroglyphs (Tooele Army Depot North). A Great Basin Rock Art Thematic District of selected petroglyph sites in Utah is pending nomination to the NRHP. The sites listed in the nomination are representative of the Great Basin Style rock art found in the state. The sites listed are eligible individually for the NRHP, but by nominating them in a thematic nomination, Utah hopes to signal the importance of the Great Basin Style as a whole to current research problems.

The following information about Great Basin Style rock art was excerpted from the nomination form:

"Great Basin Style rock art is primarily a petroglyph style, originally defined by Julian Steward (1929) and described in detail by Heizer and Baumhoff (1962). Heizer and Baumhoff identified three major and two minor styles within the overall classification. The three major styles are Great Basin Pecked, Great Basin Painted, and Great Basin Scratched. Only Great Basin Pecked has been noted in any quantity in Utah."

Within the Great Basin Pecked Style are two minor styles, Great Basin Representational and Abstract. Representational elements, as the name implies, are anthropomorphs, mountain sheep and other quadrupeds, snakes, lizards, etc. The Abstract forms are further divided into two substyles: Rectilinear and Curvilinear. Rectilinear motifs are squares, rectangles, dots, zig-zags, and any other which involves a straight line. Curvilinear designs are the most distinctive and common of all the Great Basin styles. They are also very well defined (Baumhoff, Heizer and Elasser 1958) as follows:

"The circle, in one context or another, is the common element of this style but perhaps a more characteristic element is the curvilinear meander. These meanders have a vague sort of composition in that they tend to fill an area defined by the outline of a single boulder. But aside from two restrictions -- curving lines without abrupt discontinuities and spatial restrictions provided by the areas of a single boulder face -- there seems to be no aesthetic discipline imposed on the style. The lack of discipline is no doubt attributable to the nature of the materials. Petrography is essentially a decorative art -- an attempt to embellish an object without reshaping it. But the objects that are decorated, in this case the boulders, are not themselves made by man and therefore they do not possess any degree of uniformity to provide a consistent set of restrictions within which the art might develop. The shapes of the boulders are endlessly and randomly varied so that no uniform set of artistic principles can be applied to their decoration."

"Heizer and Baumhoff feel that the Abstract style is older than the Representational, and that Curvilinear is the older of the two Abstract styles. However, in no instance does one style replace the other; the Representational designs in many cases appear to be as old as the associated Curvilinear forms. That is, there is the same amount of patination on each (a relative and hardly definitive form of dating). Where such determinations can be made, however, Curvilinear designs are consistently older. The Curvilinear Style has been tentatively dated by Heizer and Baumhoff to 3500 to 500 B.P. and is apparently associated with the Late Archaic desert cultures."

Rocky Ridge petroglyph contains Great Basin Representational and Abstract designs. The significance of the Great Basin Style petroglyph site lies in their probable antiquity, their relevance to current research problems in the Great Basin and their ability to provide a relative sequence of rock art with patination studies. The site may be eligible for inclusion in the National Register Rock Art Thematic Nomination.

The rock art also may be of cultural value to the Gosiute. From the ethnographic research, Section 2.2.2, the Gosiute would visit areas where rock art exists to obtain power and knowledge for shamanistic curing practices.

Malouf (1951:53) states:

"Besides inheriting powers from parents, they could also come to an individual if he sought them in the mountains. No special preparations were made to induce dreams by resorting to physical torture, but they would first bathe, and then paint their bodies white before they left for their sojourn in the mountains. Certain caves, or rock outcroppings were believed to be the abode of the spirits with whom they wish to communicate. Often there were areas where there were numerous pictographs painted on the cave walls, or on rocks. Such an area was known as pohaghani, and suppliants were pohaghants. When in this pohaghani he would ask

) for favors from the spirits. If they were favorably impressed they would reveal much information. Elk might give him doctoring powers, while water baby would make him hardy in way. Most likely he saw Mountain Man, Toyanumbi, who taught him how to use herbs as medicine, or gave him hunting powers. Mountain man was considered as a sort of partner to the shaman. Typically this personage was described as being two or three ft. high. Steward's Skull Valley informant added that, "he wears a blanket in summer, carries a bow and arrow and may kill a man he dislikes. His shooting makes a man sick. A shaman may cure this." Most informants regarded him as benevolent rather than a tempermental clown."

Reagan (1934:45) reproduced a petroglyph from Picture Cave four miles southwest of the Gosiute Indian Agency, Ibapah, Utah (Figure 6-3). On examination of the petroglyphs at Tooele Army Depot and those taken from Reagan, several elements appear to be the same (Figure 6-4).

To comply with the Native American Religious Freedom Act, two members of the Gosiute Tribe were contacted. Burt Wash, Chairman of the Gosiute Skull Valley Reservation, was contacted and a meeting was arranged at Grantsville, Utah. Neither Mr. Wash nor a tribal representative arrived for the meeting. Mr. Dan Murphy, Chairman Deep Creek Gosiute Reservation was contacted by mail; no response was received to the request for his aid in addressing the Gosiute Native American concerns.

Because the Rocky Ridge petroglyphs are deteriorating and may be eligible for inclusion in the NRHP, it would be advisable and in the public interest for the Army to preserve and record the site (See Section 6.3.3, Recommendation III). Although the Army submitted a NRHP nomination form to the Utah SHPO in February 1981, the form was returned and more information requested. The nomination is retained in the SHPO office until the requested information is completed. A rock art specialist should be retained to assist the Army in recording the panel and completing the NRHP form.

Johnson Cemetery (Tooele Army Depot South). The cemetery has been fenced and is maintained by the Johnson family. Ordinarily cemeteries are not eligible to the NRHP; a cemetery is only eligible if it is a cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design values, or from association with historic events. It is doubtful if the cemetery meets the criteria set forth in 36 CFR 60.6. Federal and state regulations prohibit disinterment unless specific actions are taken. The state must be contacted regarding the regulations, if the cemetery will be affected by Army activities.

All of the project-specific management recommendations require consultation with the SHPO. If eligible properties will be affected by project activities, compliance with Section 106 is required and the Army is obliged to request ACHP comment. Figure 6-5 outlines the procedure for compliance with ACHP regulations, 36 CFR 800 and AR.420.XX.

6.2.3 A Summary of Recommended Management Direction and Priorities for Effective Compliance and Program Development

It is recommended that a professional archeological inventory and evaluation be completed in the areas where new construction is planned as

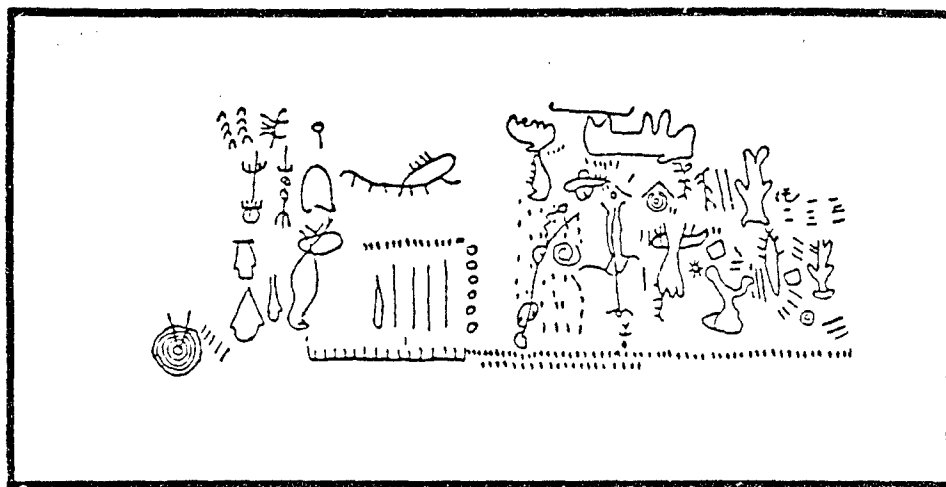


Figure 6-3. PICTURE CAVE PETROGLYPH



Figure 6-4 ROCKY RIDGE PETROGLYPH

ADVISORY COUNCIL REGULATIONS FOR THE PROTECTION OF
HISTORIC AND CULTURAL PROPERTIES, 36 CFR 800

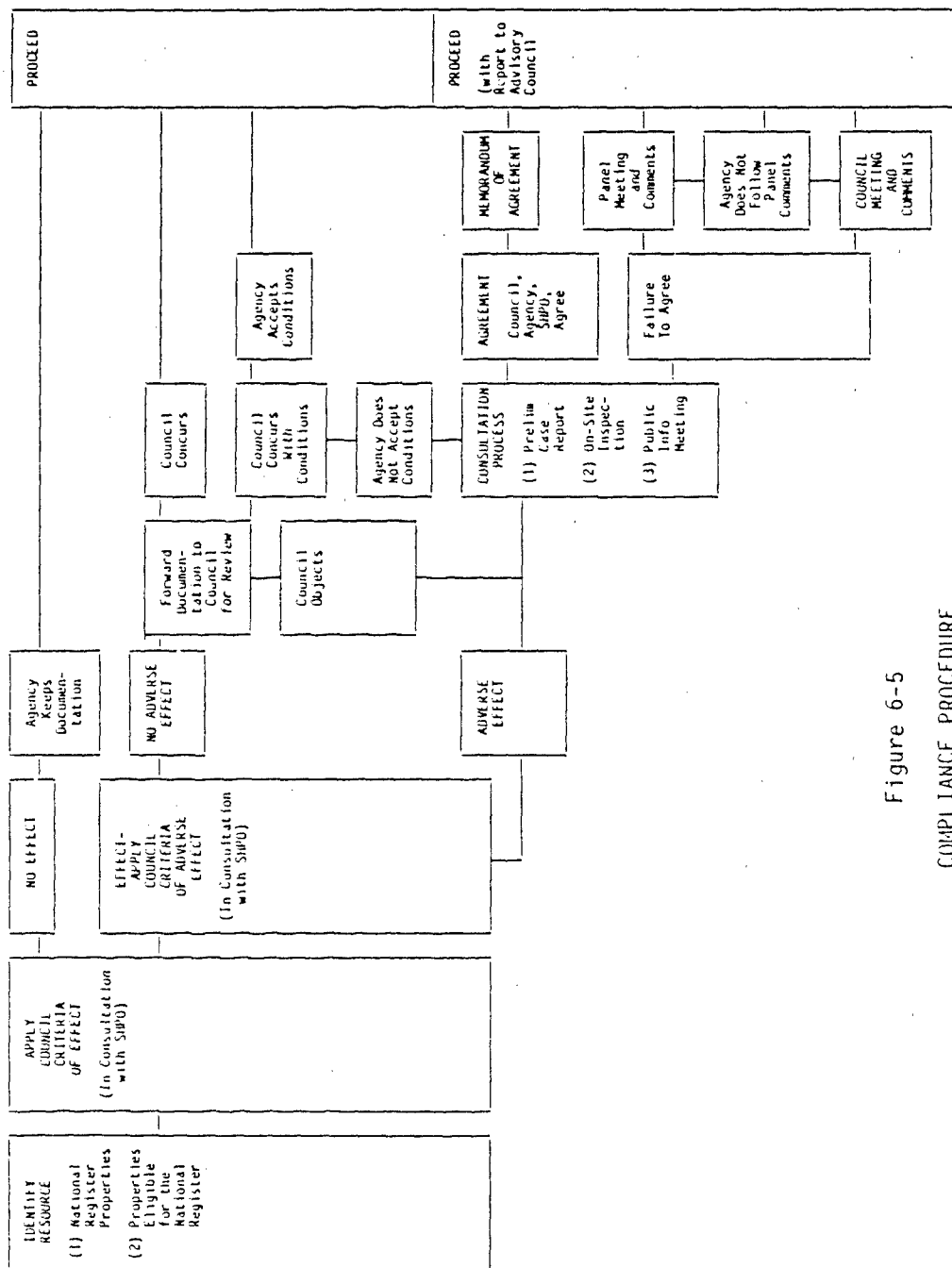


Figure 6-5
COMPLIANCE PROCEDURE

soon as possible (Table 6-1). It is appropriate to complete a field inventory to identify archeologically sensitive areas on the buffer and grazing areas for compliances with Executive Order 11593 and Section 110 of the National Historic Preservation Act (NHPA.) It is recommended that for new construction activities in Areas III and IV, a professional archeologist monitor ground-disturbing activities (Table 6-1). Further, the Fremont Village and the Rocky Ridge Petroglyph sites should be evaluated by a professional archeologist for inclusion in the NRHP.

6.3 ESTIMATES OF SCOPE OF WORK AND COST LEVELS FOR PRESENTLY IDENTIFIABLE MANAGEMENT NEEDS

6.3.1 Recommendation I

While no future construction activities are planned for the buffer and grazing areas, Executive Order 11593 and Section 110 of the National Historic Preservation Act (NHPA) require a land-holding agency to identify significant cultural properties under their jurisdiction for future planning needs. Therefore, the first long-range management recommendation includes an intensive field inventory of the buffer areas and grazing zones at both the North and South Posts. The North Post comprises 6705 buffer acres (2714 hectares); the South Post comprises 83 grazing acres (34 hectares), and 8822 buffer zone acres (3570 hectares), a total of 8905 acres (3604 hectares). A field inventory is not recommended in other areas of the North and South Posts because of the sensitive nature of the installation and extensive prior ground disturbances.

An intensive archival and historical review should precede the field survey and require an estimated 15 days for completion. The field inventory should be conducted by a professional archeologist who meets the qualifications outlined in Appendix C of AR.420.XX, the NPS regulation 36 CFR 61.4 and/or the Society of Professional Archeologist (SOPA), and have obtained an Antiquities permit issued by the Secretary of the Army, granted in accordance with AR.405-80. The archeologist should have demonstrated expertise in the Great Basin. The inventory should be conducted with field personnel at close intervals. All cultural resource locations and required information should be incorporated on the Utah Intermountain Antiquities Computer System (IMACS) site form. Only diagnostic artifacts, i.e., projectile points and pottery, or artifacts in danger of being lost should be collected. Any artifacts recovered should be properly curated in a location approved by the Army. All cultural properties should be evaluated for inclusion in the NRHP, recommendations should be made for an appropriate management program.

At a rate of 90 acres a day, and an assumed site density of three sites per square mile, field operations are estimated to require at least 75 days (North Post) and 99 days (South Post). The expenses for field inventory do not include costs for subsurface investigation. The field inventory, analysis, and evaluation program including travel (local expertise only), communication, and report preparation will average \$20 to \$25 per work hour. Archival review and supervisory personnel average between \$25 to \$35 per work hour. The costs of this optional management recommendation are estimated in 1983 dollars (Table 6-2). The cost estimate covers only routine involvement of the subcontractor in the consultation (SHPO and ACHP) process.

Table 6-2

COSTS OF OPTIONAL MANAGEMENT RECOMMENDATION

<u>NORTH POST</u>					
	<u>Acres</u>	<u>Acres Per Day</u>	<u>Man Days</u>	<u>Man Hours</u>	<u>Total Dollars</u>
Archival		-	15	160	\$ 3,000
Field Survey	6705	90	75	600	12,000
Report Analysis			150	1200	<u>24,000</u>
				lowest	\$39,000
				highest	49,800

Costs are between \$39,000 and \$49,800.*

<u>SOUTH POST</u>					
Archival		-	15	160	\$ 3,000
Field Survey	8905	90	99	792	15,840
Report Analysis			214	1712	<u>34,240</u>
				lowest	\$53,080
				highest	65,240

Costs are between \$53,080 and \$65,240.*

*Estimated costs do not include administrative costs or fee/profit.

Milestone for sequential procedures are:

- Complete archival and oral historical review to document potential significance of any historic archeological resources which might be located in the Army Depot.
- Complete field inventory and evaluation of all identified archeological, historical, or architectural resources.
- Complete draft report on field investigations, recommended evaluations, and management program for DARCOM review.
- Complete DARCOM review, get DARCOM approval for interagency review.
- Complete consultation among Utah SHPO, DARCOM, and the cultural resource consultant concerning evaluations and HPP.

- Complete review by the Keeper of the NRHP of evaluation submitted by DARCOM (a letter of agreement will complete documentation).
- Initiate consultation process among DARCOM, SHPO, and ACHP on the HPP submitted as a basis for a Preliminary Case Report for MOA.

6.3.2 Recommendation II

Fremont Village site, Steward's House Mounds #3, 4, 5, 6, and 9 should be evaluated for inclusion in the NRHP by determining the present condition of the site, to determine if the site will yield information important to prehistory.

A mapping program should be developed which may include aerial photography, resistivity, or proton magnetometer testing to determine if there are subsurface features. Aerial photographic mapping early in the spring when differential vegetation growth can reveal subsurface moisture differences (pits act as water catchments) might detect unknown and unexcavated pithouses. Analyses of these kinds would be followed by on-site testing to establish confidence in the interpretation of results. Resistivity or proton magnetometer readings may produce useful results in determining fire pits, pit houses, and other features.

It would be necessary to perform a historical and archival review only if this had not been completed in connection with Recommendation I. All qualifications outlined in Recommendation I should be met. A field investigation should include some of these cost-effective methods. Mapping of the site, including subsurface testing, should take the crew of three people seven days to determine boundaries and extent of destruction. Due to specialized equipment recommended for testing, the labor rate is estimated at \$30 to \$45 per hour. Estimated costs of the evaluation program for field survey and mapping including necessary travel, communications, data management, and report preparation are between \$15,120 and \$17,640. These costs include preparation of the NRHP form, if appropriate, and limited participation in the SHPO consultation process. Aerial photography including plane, photographer, interpretation, and report would cost an estimated \$1685. Estimated costs do not include administration costs, fee, or profit.

Milestones for sequential activities include:

- Complete aerial photography and interpretation to identify vegetation changes and outlines of subsurface structures.
- Complete field investigation including mapping, resistivity studies, and subsurface testing.
- Complete evaluation of significance.
- Complete NRHP inventory form, if appropriate.
- Complete consultation process with Utah SHPO for eligibility determination with necessary documentation, if appropriate.
- Complete review by the Keeper of the NRHP of evaluation submitted by DARCOM (a letter of agreement will complete documentation).

6.3.3 Recommendation III

It is recommended that the Rocky Ridge Petroglyph site be recorded and

evaluated by a professional rock art specialist. Consideration also should be given to protecting the rock panel from the elements.

The scope of work should include:

1. Photograph the panel with both black and white and color film with a proportion scale.
2. Trace the rock panel with a fine pencil on mylar overlays, drawing around the designs directly on the rock surface, noting the depth and degree of pecking in field notes. The mylar can be color coded in the laboratory using light tones inside the designs with black outlining.
3. Measure all design elements and motifs.
4. Make (optional) Latex molds for accurately recording rock art. However, it is important to retain a specialist who understands the process. The mold has a life of 3 to 4 years, but plaster of paris casts are taken for permanency and accuracy. The casts can then be painted to duplicate the rock art.

The documentation should be submitted to the SHPO for inclusion in the cultural resource inventory file. The specialist also should assist the Army in completing the NRHP form requesting that the SHPO consider the rock art panel for inclusion in the Utah thematic group nomination.

The minimal time frame for field work (recording of elements on mylar), interpretation and report should be five man days including travel and per diem. At a rate of \$30 per man hour, the total cost for recording the site, including completion of a NRHP form is estimated to be \$1200. The cost of building a protective roof over the rock art is estimated to range between \$500 and \$1000.

Milestones:

- Complete tracing and measuring all rock art elements on mylar.
- Complete photographing the panel.
- Complete analysis, evaluation and report preparation.
- Complete NRHP, if appropriate, to initiate the consultation process with the SHPO to include the petroglyph in the Utah thematic group nomination.

6.3.4 Recommendation IV

It is recommended that monitoring of construction activities in areas I, III, and IV (Figure 6-1) be completed. Each project is identified along with the area of expected ground disturbance in Table 6-1.

The scope of work requires monitoring or surveillance of construction activities by a professional archeologist who meets the previously cited standards. Areas of ground-disturbing activities are: Area I - 10.1 acres (4.1 hectares), Area III - 45.3 acres (18.3 hectares), and Area IV - 51.8 acres (21 hectares). Monitoring will require some preliminary archival and oral historical research, and on-site examination during ground-altering

activities to determine if any previously undiscovered cultural resources are present. If cultural resources are encountered, the Historical Preservation Officer should be notified and the procedures outlined in AR.420.XX should be followed:

Discovery of Historic Property During an Undertaking (AR.420.XX:4-11).

- When a historic property is discovered during an undertaking, the commander will ask the Secretary of the Interior to study the discovery to see what 36 CFR 800.7 requires. This study should start within 48 hours of the Secretary of the Interior being notified.
- The commander will phone the NPS to request the study and will send a telegram to confirm the request.
- The commander will advise the SHPO and MACOM (sic) at the same time.
- If the Secretary of the Interior or commander find that the ACHP should be advised of the find, the commander will request ACHP comments (36 CFR 800.8(b)).

Generally cultural resources found in these areas at Tooele Army Depot may be disturbed and have little or no site integrity. However, should potentially significant prehistoric or historic remains be discovered, their appropriate treatment needs should be evaluated before continuing construction. Any human remains that are encountered, should be handled following the U.S. Department of the Interior (1982) guidelines for burial treatment.

All areas in Tooele North and South Posts with ground-disturbing activities that should be monitored total 107.2 acres (43.4 hectares).

Area I	10.1 acres - 2 work days
Area III	45.3 acres - 5 work days
Area IV	51.8 acres - 6 work days
All proposed sewer and water lines	7 work days

The minimal time frame for monitoring activities is 10 acres per day for a one man crew. The time parameters are estimated and land modification plans should be reviewed before preparing the scope of work. An estimated 5 work days for historic review and, depending on general construction schedules, minimally 20 estimated work days for monitoring. Another 25 work days should be scheduled for reporting the monitoring results. This schedule is based on a limited number of cultural items being recovered and no involvement in the consultation process. To adhere to this schedule, consideration should be given to scheduling construction projects so the archeologist can monitor each project in sequence. The logistics connected with scattered acreage will not permit a lower cost per acre figure for monitoring.

Based on the above assumptions and qualifications, the archival research, monitoring and report preparation would require a minimum of

50 man days estimated at \$20 to \$25 per work hour, including travel, per diem, and report preparation. Estimated costs in 1983 dollars are between \$8,000 and \$10,000. The cost could increase drastically if construction schedules overlap and if data recovery is required.

Assuming that no significant archeological or historical resources are identified during these activities, milestone for monitoring would sequentially include:

- Complete archival and historical research.
- Complete archeological monitoring program.
- Complete report including results from archival review and monitoring activities for approval by DARCOM.
- Submit report to the Utah SHPO.

If archeological and historical materials are identified that appear to be eligible for inclusion in the NR, the program should include these milestones:

- If a resource is identified, the ground disturbing activity should be interrupted, until the materials have been evaluated. In-field consultation should involve the U.S. Department of the Interior Archeologist or his designee and the Utah SHPO. If the resource is not considered eligible, construction may resume. If, however, the resource is considered eligible, professional recovery may be required to mitigate the adverse effect.
- A report containing a description and analysis of materials recovered should be prepared for inclusion in the installation project report. Curation of the materials recovered should be a part of this effort.

The appropriate state and federal consulting authorities are: The Utah State Historic Preservation Officer (SHPO), 300 Rio Grande, Salt Lake City, Utah, 84101 (He is the consulting agent for compliance responsibilities outlined in 36 CFR 800 and should be contacted for any problems relating to cultural resource management.); the Utah State Archeologist, 300 Rio Grande, Salt Lake City, Utah 84101; National Advisory Council on Historic Preservation (NACHP), Western Division of Project Review, 730 Simms Street, Room 450, Golden, Colorado, 80401; U.S. Department of the Interior, National Park Service, Interagency Archeological Services, 655 Parfet Street, P.O. Box 25287, Denver, Colorado, 80225.

SECTION 7

7.0 SUMMARY

Prehistoric and historic archeological properties are known to be present on the undisturbed portions of the Tooele Army Depot (North and South Posts). Since much of the Depot has been disturbed through construction and other activities, the recommendations contained in this report pertain to a comparatively small portion of the total area.

While prehistoric resources of the Paleo-Indian Stage and the Formative Stage (Fremont Period) are considered to be especially critical, it is also true that our knowledge of the Archaic Stage and the Post Formative Stage is incomplete. Consequently, any resource assignable to these periods should be carefully managed to ensure that their potential informative content is not lost.

Compliance with the various provisions of the National Historic Preservation Act (NHPA), the Archeological and Historic Preservation Act, 36 CFR 800, and Draft Army Regulation AR.420.XX requires the identification, evaluation, and where feasible, positive management of significant prehistoric and historic archeological resources. Draft Army Regulation AR.420.XX also requires that each U.S. Army Materiel Development and Readiness Command (DARCOM) installation develop and implement an Historic Preservation Plan (HPP). Consequently, a series of management recommendations are presented in this report. These recommendations are as follows:

1. In those areas where a subsurface potential for discovery exists, and where construction is scheduled, subsurface disturbance should be monitored by a professional archeologist. In those areas where new construction will affect surface areas that may destroy or impact unknown archeological resources, a surface survey should be conducted prior to construction. It is estimated that this monitoring program will range in cost between \$8,000 and \$10,000 in 1983 dollars.
2. The known sites, Steward's House Mound site, the Rocky Ridge Petroglyph site, should be preserved and documented. Estimated costs for Steward's House Mound site range between \$15,120 and \$17,640 plus \$1685 for aerial photography. Estimated costs for documenting the Rocky Ridge Road Petroglyph site plus building a roof to protect the site are estimated from \$1,700 to \$2,200. Estimates are in 1983 dollars.
3. Buffer zones and grazing areas consisting of 6,705 acres (2,174 hectares) and 8,905 acres (3,604 hectares), North and South Posts respectively, should be subjected to intensive survey by a professional archeologist. Cost estimates range between \$39,000 and \$49,800 (North Post) and between \$53,080 and \$65,240 (South Post) in 1983 dollars.

If eligible properties are found during the course of survey or monitoring, plans should be developed in consultation with the Utah State Historic Preservation Officer (SHPO) and the National Advisory Council on Historic Preservation (ACHP) to either avoid or to mitigate the adverse effect.

SECTION 8

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APPENDIX A

APPENDIX A

APPENDIX A CLASSIFICATION METHODS FOR SITE AND LANDFORM TYPES

Classification methods used to describe both site type and landform type (Tables 4-2) are those found in the Intermountain Antiquities Computer System (IMACS) User Guide (Table A-1 and A-2) currently in use in the State of Utah. In the case of Steward's house mound site and the rock art site the classification reflects current usage prevalent in either the literature or in the files of the Office of the State Archeologist for the State of Utah.

Table A-1. LANDFORM NAMES FOR DARCOM ARCHEOLOGICAL OVERVIEWS AND MANAGEMENT PLANS

Geographic Reference	Primary Landform	Primary Position	Secondary Landform	Secondary Position	On-Site Content
Desert West*	Mountain Hill Tableland/Mesa Ridge Valley Plain (upland) Canyon Coast/Shoreline	Top/Creek/Peak Edge Slope Toe/Foot/Bottom/ Mouth Saddle/Pass Bench/Ledge Rimrock Interior	Alluvial Fan Alcove/Rock Shelter Arroyo Basin Cave Cliff Delta Detached Monolith Dune Floodplain Ledge Mesa/Butte Playa Portable Geological Plain Ridge/Knoll Rockshelter Slope Terrace/Bench Talus Slope Island Outcrop Spring Mound/Bog Valley Cutbank Riser	Top/Crest/Peak Edge Slope Toe/Foot/Bottom/ Mouth Interior Step Riser Patterned Ground Face (i.e., Cliff Face Saddle/Pass	Fan Talus Dune Stream Terrace Playa Shore Feature, Extinct Lake Shore Feature, Existing Lake Alluvial Plain (Canyon, Valley Fill) Colluvium Moraine Flood Plain Marsh Landslide/Slump Delta Desert Pavement Outcrop Stream Bed Aeolian None (Rock Art, No Soil) Residual

*Intermountain Antiquities Computer System (IMACS) Users Guide: Instruction and Computer Codes for use with the IMACS Form. Univ. of Utah, Bureau of Land Management, U.S. Forest Service. 1982.

Table A-2. RESOURCE TYPE NAMES FOR THE DARCOM ARCHEOLOGICAL OVERVIEWS AND MANAGEMENT PLAN

Prehistoric Components	Historic Components	
	Themes	Structure/Function
Agricultural fields	Agriculture and Ranching (AR)	Lean-to
Bedrock mortars		Mill
Burial	Commercial (C)	Mine shaft
Burial mound	Domestic (D)	Monument
Butchering station	Education (ED)	Quarry
Camp	Exploration (EX)	Pipeline
Cemetery	Government (political, economic aspects (G),	Ranch
Fieldhouse	Manufacturing craft (MC)	Railroad bed/trestle
Fortification	Manufacturing, industrial (MI)	Road
Fortified village	Military (MI)	Shed/garage
Habitat site	Recreation (RC)	Springhouse
Irrigation ditch/dam/system	Religious (RL)	Tramway
Kill site	Transportation and Communication (TC)	Trestle
Limited activity area		Town
Lithic workshop		Village
Medicine wheel		Wall
Midden		Well/cistern
Mound		Windmill
Plant gathering site		
Quarry		Barn
Road		Barracks
Rock art (pictography, petroglyph)		Bridge
Rock circles		Bulkhead
Scarred tree		Cabin
Tipi rings		Cairn
Trail		Cemetery
Village		Church
		Dam
		Ditch
		Dock
		Dump
		Farm
		Fire tower
		Flume/raceway
		Fort
		Fortification
		Granary
		House

Note: This list is not intended to be exhaustive, but to provide guidance in the array of functional labels that may be appropriate to the DARCOM resource base. Prehistoric functional names will not include landform data (e.g., open terrace, rockshelter) within the resource type name.

APPENDIX B

APPENDIX B LOCATIONAL DATA, KNOWN AND POTENTIAL ARCHEOLOGICAL
RESOURCES ON TOOELE ARMY DEPOT

Table B-1. LOCATION DATA, KNOWN AND POTENTIAL ARCHEOLOGICAL RESOURCES ON TOOELE ARMY DEPOT

Site Number	UTM(a)		Reference	Legal Reference		USGS Quad Map (b)	CR (c)
	Northings	Eastings		Township	Range		
Known Resources							
Steward's #3, 4, 5, 6, & 9			Vol. Utah				
	4490520	375720			SW/NW Sec. 18	1	3
	4490580	376300			NW/SW/SW 18	1	3
	4487920	375930			NW/NW 19 SW/NW 19 NE/NE 24 SE/NE 24	1 1 1 1	3 3 3 3
42T0164	4489560	385880		T3S	R5W SW/SW/SE Sec. 13	2	3
Potential Resources							
Tooele (North)	See above for Steward's 3, 4, 5, 6 & 9 (area outside of mounds has potential)						
Tooele (North)	4491100	379220		T3S	R5W NW 1/4 Sec. 16 NE 1/4	1	3
	4491100	381200		T3S	R5W Sec. 16	1	3
	4490480	380940		T3S	R5W NW 1/4 Sec. 15	1	3
	4490480	379400					
Tooele (South)	4465550	385670		T6S	R4W All of Section 6	3	3
	4465550	387290		T6S	R4W NW/NW Sec. 7	3	3
	4463420	387290		T6S	R4W NE/MW Sec. 7	3	3
	4463600	385680		T6S	R4W MW/NE Sec. 7	3	3
				T6S	R4W NE/NE Sec. 7	3	3

(a) Universal Transverse Mercator (UTM)

Zone 12 TUV

(b) U.S. Geological Survey (USGS)

1 - Grantsville, UT 7.5 min (1955)

2 - Tooele, UT 7.5 min (1955) Rev. 1969

3 - Ophir, UT 7.5 min (1960)

(c) Confidence Rating (CR) of 3 indicates that professional evaluations as to physical integrity and research value are most likely reliable.

TOOELE SUPPLEMENT

CULTURAL RESOURCES OVERVIEW AND MANAGEMENT PLAN
FOR
TOOELE ARMY DEPOT RAILROAD (AD-RR) MAINTENANCE FACILITY

A SUPPLEMENT TO THE DARCOM ARCHEOLOGICAL OVERVIEW
AND
MANAGEMENT PLAN FOR TOOELE ARMY DEPOT, UTAH

Prepared by
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PREFACE

The Tooele Army Depot Railroad (AD-RR) Maintenance Facility was initially included in the nationwide archeological resources overview and management project for the U.S. Army Materiel Development and Readiness Command (DARCOM). The railroad maintenance and repair shops, while administered by the Tooele Army Depot, are located and leased from the Hill Air Force Base near Ogden, Utah. On June 29, 1983, DARCOM eliminated the Tooele AD-RR maintenance facility from the overview and management process. Prior to the announcement, the following information was collected and is presented here as a supplement to the Tooele Army Depot report. The supplement contains only those elements unique to this part of the Tooele Army Depot facility.

MANAGEMENT SUMMARY

Work performed by the research team to prepare this overview and management plan for the Tooele Army Depot Railroad (AD-RR) Maintenance Facility consisted of data acquisition, including a file search and literature review, an on-site inspection; and assessment of the archeological resources. The significant results of the survey are as follows:

- There is no record of any prior archeological survey on the facility.
- Because the area under consideration has been totally modified by construction of the railroad maintenance and repair shops, it is highly unlikely that there are any prehistoric archeological resources, significant or otherwise, at this location.
- However, the facility may provide useful historical data pertaining to the railroad's conversion from steam to diesel locomotives.

CONTENTS

	<u>Page</u>
PREFACE	i
MANAGEMENT SUMMARY	ii
CONTENTS	iii
FIGURES	v
TABLES	vi
 1.0 INTRODUCTION	
1.1 Purpose and Need	S-1
1.2 The Tooele Army Depot Railroad (AD-RR) Maintenance Facility	S-1
1.3 Summary of Previous Archeological Work Conducted on the Tooele AD-RR Maintenance Facility	S-1
1.4 The Sociocultural Context of the Archeological Resources on the Tooele AD-RR Maintenance Facility	S-1
 2.0 AN OVERVIEW OF THE CULTURAL AND RELEVANT NATURAL HISTORY OF THE TOOEELE ARMY DEPOT RAILROAD (AD-RR) MAINTENANCE FACILITY	S-3
2.1 Physical Environment	S-3
2.1.1 Earth Resources	S-3
2.1.2 Water Resources	S-4
2.1.3 Modern Climate	S-4
2.1.4 Plant Resources	S-4
2.1.5 Animal Resources	S-4
2.1.6 Paleoenvironment	S-5
2.2 The Cultural Environment	S-5
2.2.1 Prehistory	S-5
2.2.2 Gosiute and Western Shoshoni Ethnography	S-5
2.2.3 History	S-6
2.3 Archeological Research Directions	S-8
2.3.1 Regional Concerns	S-8
2.3.2 Installation-Specific Archeological Research Directions	S-8
 3.0 AN ASSESSMENT OF ARCHEOLOGICAL RESOURCE PRESERVATION AND SURVEY ADEQUACY	S-11
 4.0 KNOWN ARCHEOLOGICAL RESOURCES ON THE TOOEELE ARMY DEPOT RAILROAD (AD-RR) MAINTENANCE FACILITY	S-14
 5.0 AN ASSESSMENT OF THE SIGNIFICANCE OF THE ARCHEOLOGICAL RESOURCE BASE ON THE TOOEELE ARMY DEPOT RAILROAD (AD-RR) MAINTENANCE FACILITY	S-15

CONTENTS (Continued)

	<u>Page</u>
6.0 A RECOMMENDED ARCHEOLOGICAL MANAGEMENT PLAN FOR TOOELE ARMY DEPOT RAILROAD (AD-RR) MAINTENANCE FACILITY	S-16
6.1 Facility Master Plans	S-16
6.2 Appropriate Goals	S-16
7.0 SUMMARY	S-17
8.0 BIBLIOGRAPHY	S-18

LIST OF FIGURES

		<u>Page</u>
Figure 1-1	Master Facility Map of AD-RR Maintenance Facility	S-2
Figure 2-1	Areas of Potential Archeological Sites, Tooele AD-RR Maintenance Facility	S-9
Figure 3-1	Map of Historic and Modern Ground Disturbance at The Tooele AD-RR Maintenance Facility	S-13

LIST OF TABLES

		<u>Page</u>
Table 3-1	A Summary of Historic and Modern Ground Disturbance that Might Limit the Present Archeological Resource Base on the Tooele Army Depot Rail Shops	S-12

CHAPTER 1.0 INTRODUCTION

1.1 PURPOSE AND NEED

This study was conducted for the Tooele Army Depot Railroad (AD-RR) Maintenance Facility to develop a comprehensive cultural resource management plan. This plan should be addressed in the installation Master Plan for compliance with the federal statutes regarding cultural resources defined in the main body of this report.

1.2 THE TOOELE AD-RR MAINTENANCE FACILITY

The Tooele AD-RR Maintenance Facility consists of maintenance and repair shops on a 28-acre (11.3 hectare) tract within the Hill Air Force Base (Figure 1-1). These shops comprise the only railroad maintenance facility within the Department of Defense (DOD). The facility is administered by the Tooele Army Depot, leased from Hill Air Force Base, and supported by the 2849th Air Base Group Civil Engineer. Construction of the air base began in 1938 with the Transportation Depot Maintenance Division Shop being completed in 1942 and rebuilt in 1954.

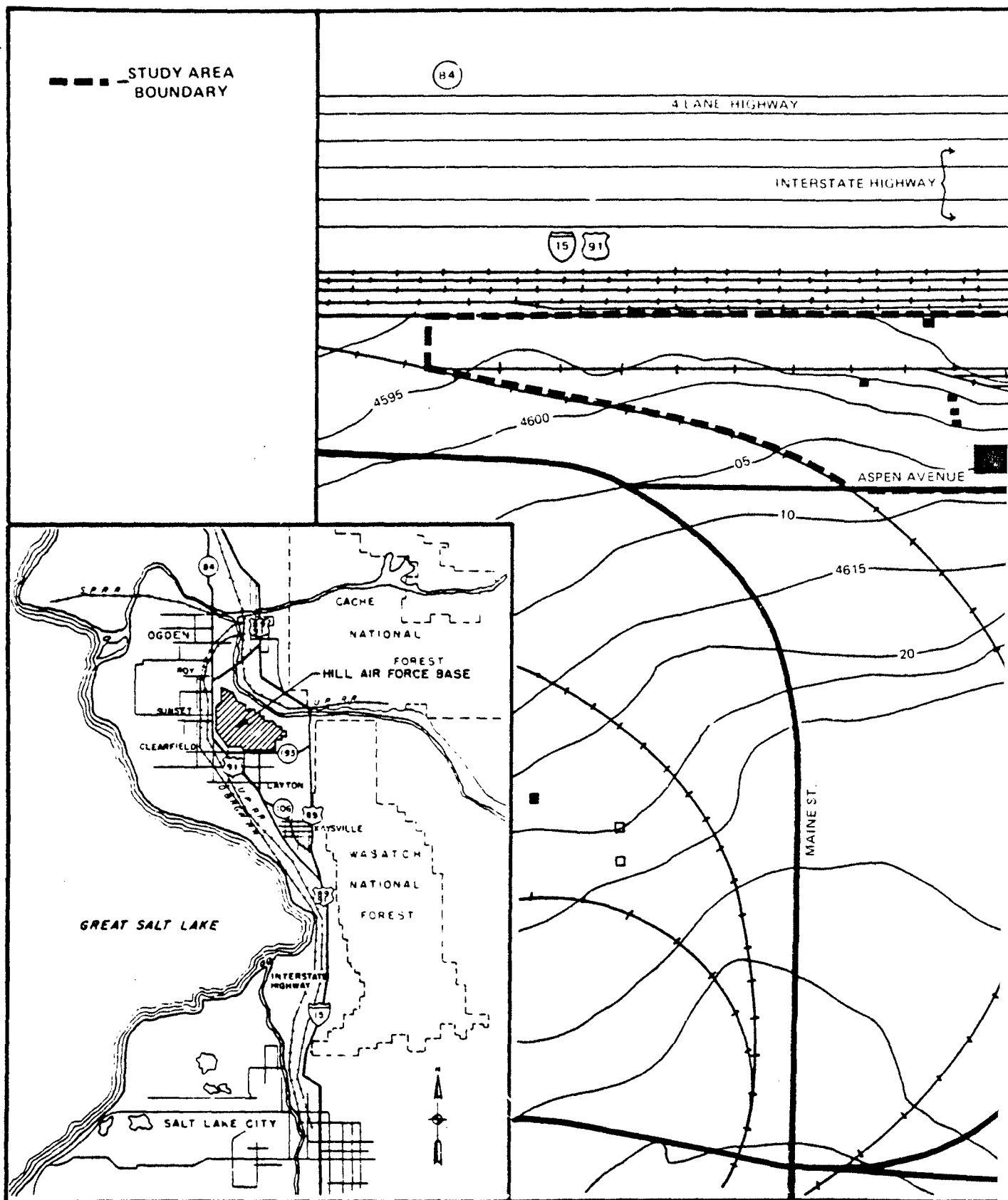
The railroad maintenance facility consists of 11 buildings, including the transportation Depot Maintenance Division Shop and adjoining storage facilities. The associated railroad tracks cover almost the entire area.

1.3 SUMMARY OF PREVIOUS ARCHEOLOGICAL WORK CONDUCTED ON THE TOOELE AD-RR MAINTENANCE FACILITY

A file search of the cultural resource inventory in the Offices of the Utah State Archeologist and Bureau of Land Management (BLM) Salt Lake District Office, and a review of the National Register of Historic Places (NRHP), failed to disclose any evidence of previous archeological work on the railroad maintenance facility.

1.4 THE SOCIOCULTURAL CONTEXT OF THE ARCHEOLOGICAL RESOURCES ON THE TOOELE AD-RR MAINTENANCE FACILITY

There are no known prehistoric resources on the railroad maintenance facility. However, the facility could be of interest in interpreting technological aspects of railroad history in the West.



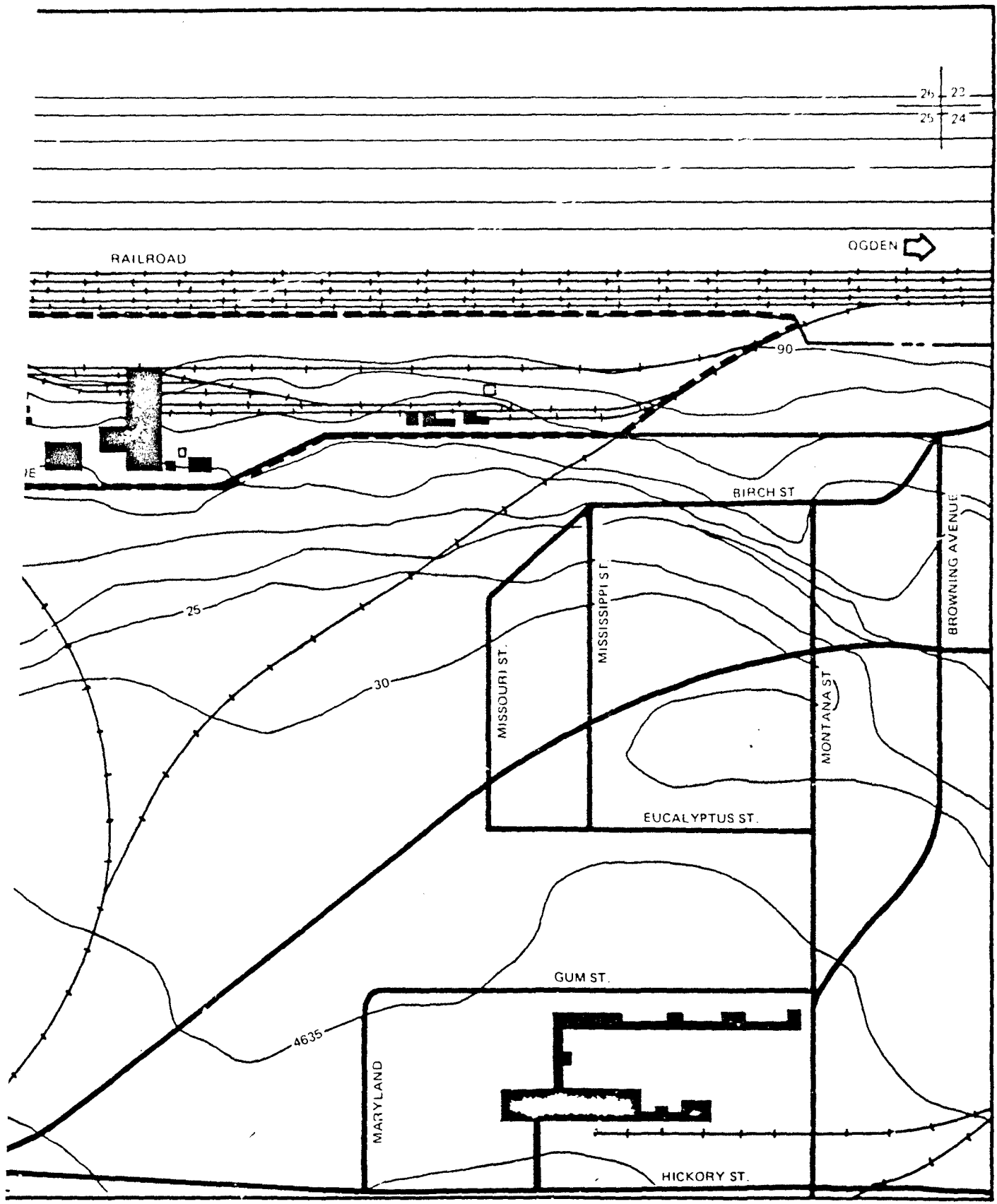


Figure 1-1. MASTER FACILITY MAP OF TOOELE

CHAPTER 2.0 AN OVERVIEW OF THE CULTURAL AND RELEVANT NATURAL
HISTORY OF THE TOOELE ARMY DEPOT RAILROAD (AD-RR)
MAINTENANCE FACILITY

2.1 PHYSICAL ENVIRONMENT

2.1.1 Earth Resources

Topography. The Tooele Army Depot Railroad (AD-RR) Maintenance Facility is on the western side of Hill Air Force Base near Ogden, Utah, at an approximate elevation of 4575 to 4600 ft. (1394 to 1402 m), above mean sea level. The area's topography is generally flat and fairly homogeneous, due in part to its small size.

The facility and Hill Air Force Base are located on the Weber Delta District, an area of about 400 square miles (1,036 sq. km) located between the Wasatch Range and the east shore of Great Salt Lake (Feth et al. 1966). A narrow foothill area is adjacent to the Wasatch Range, from which flatlands slope gently westward to the Great Salt Lake. The facility lies on the plain foothills and flatlands near the district's center and occupies an area 2 to 7 miles (3.2 to 11.3 km) wide and about 10 miles (16.1 km) long from north to south.

Geology. The study area is located in the eastern portion of the Great Basin Physiographic Province and the Basin and Range Geologic Province, within 5 miles (8 km) of the Wasatch Fault of the Overthrust Geologic Province on the east side. The site is on the downthrown block of the Wasatch Fault Zone (west side of the fault) which is a complex system of "down-on-the-west" normal and reverse faults and "up-on-the-west" thrust sheets of various ages in the late Tertiary and Quaternary. Pediments and alluvial fills fan out toward the Great Salt Lake Basin forming the overburden deposits which have filled the depressed fault block on the western side of the Wasatch Fault Zone (Hintze 1975).

The alluvial fills were formed in part by stream discharge from the Wasatch Mountain Range to the east and reworked pediment slopes during lacustrine stages of the prehistoric Lake Bonneville. The rail shops are located on a thick sequence of pediment, alluvial, and lacustrine sediments. These sediments act as ground water storage reservoirs when salt water does not interphase; recharge is ample from the Wasatch Mountains. The Lake Bonneville Group sediments found at the study site have served as a source of aggregate and fill materials for construction projects in the Salt Lake City area.

Soils. The facility's soils are in the calcic argixerolls-calcic haploxerolls association (Wilson et al. 1975). These are deep, well drained, non-saline, neutral to moderately, or strongly alkaline soils. The surface layer's textures are loam, sand loam, and clay loam, and a calcium carbonate layer occurs at 24 to 36 in. (61 to 91 cm). Runoff is slow to rapid and sediment production is low. These soils are arable and mainly used for agriculture. Irrigated crops consist of alfalfa, small grains, corn, sugar beets, and fruit; the main non-irrigated crop is winter wheat.

2.1.2 Water Resources

The only surface water on the site is one small catchment pond. However, the region has a relative abundance of surface water. About 20 large and small streams flow from the Wasatch Range onto the plains (Feth et al. 1966). The largest and the closest is Weber River, which at the nearest point is about 2 miles (3.2 km) away. Numerous irrigation ditches carry the water from the rivers to irrigated farmlands. Extensive saline or brackish marshes border much of the Great Salt Lake, about 6 to 7 miles (10 km) west.

2.1.3 Modern Climate

The climate of the site is semi-arid and temperate, characterized by moderately low precipitation, hot dry summers, moderately cold winters, and cool springs and autumns. Temperatures are lower and precipitation is higher in the nearby Wasatch Mountains.

2.1.4 Plant Resources

Much of the facility's natural vegetation has been disturbed or removed and some areas are unvegetated or dominated by weedy species. The remaining area, and the original vegetation are in the sagebrush-grass vegetation zone (Cronquist et al. 1972) of the northern shrub biome (Fautin 1946). The location of the facility probably was not an important area for food plant collection by aboriginal populations. Food resources include seeds, roots, and greens. Principal species include arrowleaf balsamroot seeds and greens, roots of sego lily and wild onion, biennial wormwood, false tarragon, tumble mustard spp., and many grass species. A number of species also were useful for tools, medicine, or fuel by aboriginal peoples.

2.1.5 Animal Resources

Wildlife populations on the facility include low population levels of small and medium-sized species typical of sagebrush habitat. Larger, mobile, or sensitive species, requiring large areas and undisturbed habitat, are absent due to the intensive agricultural and residential use of the surrounding area. The primary inhabitants are probably blacktailed jackrabbit and Townsend's ground squirrel. Likely predators are badger, coyote, and longtailed weasel. Other typical mammals may include Nuttall's cottontail, least chipmunk, northern pocket gopher, Ord's kangaroo rat, and other small rodents (Fautin 1946, Durrant 1952).

Common resident or breeding bird species include magpie, common crow, rock dove, common night hawk, Say's pheobe, western kingbird, and sage sparrow. Typical raptors are red-tailed, marsh and ferruginous hawks, kestrel, and golden eagle. Game birds include ring-necked pheasant, mourning dove, and gray partridge (Behle and Perry 1975).

Several species of lizards and snakes probably occur (Fautin 1946), including the sagebrush and short-horned lizards, Great Basin gopher snake,

and California kingrake. Likely amphibian species are the Great Basin spadefoot toad and the tiger salamander, who inhabit in those permanent or emperhal waters presenr during the spring breeding season.

2.1.6 Paleoenvironment

Paleontology. The Lake Bonneville Group formations found at and near the Tooele AD-RR have been ranked as paleontologically sensitive formations by the State of Utah. These rankings, found in the main body of this report, place the Lake Bonneville Group formations in a range of fair to moderate importance paleontologically (Madsen 1980).

Prehistoric Environmental Changes. The natural environment of the intermountain area has changed in the past 10,000 to 15,000 years with major changes occurring near the Pleistocene-Holocene boundary. Environmental changes in the eastern Great Basin (Bonneville Basin) during the late Pleistocene and Holocene recently have been reviewed by Curry and James (1982). A schedule of significant changes determined by this and previous studies is presented in Table 2-1 of the main report.

Historic Environmental Changes. The facility's natural environment has undergone pronounced change since Euro-American settlement. Changes in the surrounding area have included diversion of perennial streams for irrigation, cultivation of land for both irrigated and dryland farming, grazing, changed fire regimes, local extermination or reduction of wildlife populations, and construction of towns, roads, industrial, military, and other facilities. The most important changes on site have resulted from construction and operation of the railroad facility and related buildings. The area around the facility, at Ogden and Kaysville, was among the first to be occupied by Mormon settlers, due to the good soils available in the sagebrush zone and availability of water and timber.

2.2 THE CULTURAL ENVIRONMENT

2.2.1 Prehistory

Four stages encompass the prehistory of the Tooele study area. These include the Lithic or Paleo-Indian, Archaic, Formative, and Post-Formative stages. These stages are discussed in detail in the main body of the report.

2.2.2 Gosiute and Western Shoshoni Ethnography

This overview provides a study of lifeways of the Western Shoshoni with primary emphasis on the Gosuite. The Western Shoshoni aboriginal territory encompassed the area of present day Tooele AD-RR Maintenance Facility, while the Gosiute encompassed the area of present day Tooele Army Depot. Both Western Shoshoni and Gosiute lifeways and material culture were similar and are described in the main body of the report.

2.2.3 History

Hill Air Force Base is located on lands that are part of the most developed and used region of Utah. For the past 160 years, these lands have served as a major transportation corridor of western commerce. Fur trappers and traders from St. Louis and the Pacific Northwest reached the Cache Valley and Bear Lake in northeastern Utah before 1824. The Great Salt Lake's shores became a starting point for expeditions further to the west, such as Jedediah Smith's trek to California in 1826 to 1827. Their explorations led to a much broader knowledge of the West by the time the fur trade boom days ended during the early 1940s, when easily trapped animals were exhausted and fashion changes lessened the demand for beaver skins.

The Mormons arrived in the Salt Lake Valley from Missouri and Illinois in 1847. Brigham Young and other church leaders sent herders into modern Davis County before 1850. They secured the Wasatch Front from Salt Lake City north to Ogden. These lands had excellent agricultural potential. The Mormon scouts found fertile soil, using natural vegetation as a measuring device, water for irrigation and power, and nearby stands of timber for building and fuel needs along the Wasatch Front areas. Early residents of Davis and Weber Counties took advantage of other natural resources, such as salt from evaporators built on the Great Salt Lake's edge. Crude lye, also found near the lakefront, was used to make soap.

Communities such as Ogden or Farmington were within easy travel of Salt Lake City, and during the 1850s and 1860s this proximity played a large role in their development. During much of the late nineteenth century, the area's farmers and stockmen depended on Salt Lake City markets to consume the majority of their produce. Cereal grains, vegetables, orchard produce, hay, dairy products, silk, sugar cane, sugar beets, and berry crops were produced and marketed in response to requests from Church leaders who hoped to broaden Utah's economic base and reduce dependency on goods produced outside the territory (Arrington 1958:194-231).

Davis County agrarians searched for crops and techniques suitable for dryland farming in areas where irrigation was either impractical or impossible due to limited water. The techniques developed by these dryland pioneers were successful enough to be copied elsewhere in Utah during the latter part of the nineteenth century and early twentieth century (Bureau of Land Management 1980). Eventually, a land use pattern developed in the area that exemplified Mormon adaptation to the environment, with intensive agriculture practiced from the landfront to the natural terrace, and the lands above devoted to dryland farming and grazing. This continued until the construction of Hill Air Force Base during the late 1930s.

Davis County and western Weber County experienced no profitable or long-term mineral development. Prospectors during the 1860s tried to mine gold and silver in the canyons of the Wasatches, but met with failure. At the same time, local residents quarried sandstone and granite for use in buildings, but the area has never been known as a stone producing center.

The final flurry of mineral activity came about during the early 1890's, when entrepreneurs from Salt Lake City began drilling gas wells near Farmington. They were led into the area by reports of natural gas seeping out in water wells and geysers of gas bubbling up through the surface on lands that had emerged from the Great Salt Lake since settlement. Between

1892 and 1895, wells were drilled and natural gas discovered. During the next year a wooden pipeline was built to Salt Lake City and for over a year natural gas flowed into the capital city. The wells went dry, and by 1900 the Farmington gas field was abandoned (Knowlton 1965:22-23, Hansen and Scoville 1955:11-13).

The development of a transportation corridor through the region dates to the appearance of fur trappers during the 1820's. These trappers frequented the Great Salt Lake's eastern shores on trips to and from hunting grounds and winter areas such as the Cache Valley. The overland immigrants often passed through Ogden for a layover at Goodyear's ranch before heading west across the Great Salt Lake Desert. This travel pattern was interrupted with the founding of Salt Lake City and re-routing of travel through Ogden. However, as the Mormons sent colonists north into Idaho, the eastern shores of the lake again were used as a north-south corridor (Stegner 1971:70-71). Ogden, the major beneficiary of the railroads in Utah, was transformed from a quiet Mormon farming community into a center of western transportation by the end of the nineteenth century. The railroads gave employment to hundreds of local men, both in construction of the lines and in operating jobs once the tracks were in place. The railroad made Ogden a center of non-Mormon activity in Utah, and by the turn of the twentieth century Ogden was considered to be rough but cosmopolitan (Athearn 1971:92-104, 237, 265-267). By 1900, the town was served by the Union Pacific, Central Pacific, (later Southern Pacific), Denver and Rio Grande, Oregon Short Line, and other railroad companies, most of which were subsidiaries of the Union Pacific (Bureau of Land Management 1980).

In the first 40 years of the twentieth century, the Farmington-Ogden area developed a mixed economy of farming, grazing, manufacturing, and commerce, all dependent on the available transportation. The arrival of the military during the late 1930s also contributed to the economy. The density of population in Ogden led to a higher crime rate, vice, saloons, and areas with substandard or marginal living conditions. All of these problems, population, and occupational trends continued until the Great Depression (Bureau of Land Management 1980, Poll et al. 1978:638).

At the end of World War I, an Army arsenal was built at Ogden to disperse munitions plants away from the Atlantic Seaboard. In the 1930s, the U.S. Army recognized Ogden's strategic importance; Ogden had excellent transportation facilities and was connected to the principal Pacific Coast seaports of Seattle, San Francisco, and San Diego. In 1936, Army Air Corps planners again visited the area and decided that lands near the city would be a perfect site for an airfield. The Ogden Chamber of Commerce supported this position and purchased vast tracts of land to prevent land speculating once news of Air Corps plans became public (Arrington et al. 1965:9-11). By the end of 1938, Hill Air Force Base was under construction.

After the United States became an active participant in World War II, two other facilities were built at Ogden, the Clearfield Naval Supply Depot and the Utah General Depot. In 1942, what became the Tooele Railroad shops were constructed to service rail equipment from the Ogden Arsenal and later Utah General Depot (Arrington and Alexander 1964,100).

Ogden suffered and prospered during the massive military build up during World War II. Approximately 52,000 defense-related jobs were created by early 1943 which eliminated unemployment and created a labor shortage. This shortage was filled by imported workers from other states, prisoners-of-

war, and part-time employed Utah high school students from as far away as Provo and Salt Lake City. The rapid job expansion led to housing shortages, increased municipal services such as police protection, and strains on the local social fabric. Vice and theft became major problems for local governments. Also, tensions developed between the Mormon population and military personnel (Alexander 1983:88-89). After the war was ended in 1945, these bases continued to operate as permanent federal installations. Today they bring millions of dollars into the Utah economy and play a vital role in the state's prosperity (Arrington and Alexander 1964:112-114).

The Tooele AD-RR Maintenance Facility became a permanent part of the U.S. Army after the war. During the immediate post-war years, the shops served the Utah General Depot but by the early 1950s, the shops repaired equipment from Army and Air Force bases throughout the region. Due to its unique role in Army operations, the railroad shops remained part of the U.S. Army after a separate U.S. Air Force was created during the late 1940s. In 1954, the shops were completely remodeled to service diesel locomotives as the Army modernized its railroad equipment. In 1955, the shops were attached administratively to the Utah General Depot, and renamed Ogden Defense Depot in 1962. Until that time, the shops had their own identity as an Army Class II facility. Throughout the late 1950s and into the 1960s, the shops continued to service rail equipment for the Army and other armed services. In 1964, the facility was assigned to the administrative control of Tooele Army Depot, where it remains today. Presently, the facility is unique because it is the only rail shop for the entire Department of Defense and equipment repairs for all agencies under Department of Defense control, assuring a continuing role in America's defense system (Arrington and Alexander 1964:108, 120). (Table 2-3 in the main body of the report provides a cultural history summary.)

2.3 ARCHEOLOGICAL RESEARCH DIRECTIONS

2.3.1 Regional Concerns

Archeological interest in the Great Salt Lake region dates to the nineteenth century (James 1980) and regional concerns are discussed in the main body of the report.

The history of the Tooele Rail shops region is the history of Utah's center of settlement and population since 1847. Because of its location in the Salt Lake City-Ogden area and the hundreds of published volumes and other studies done on the region, all pertinent topics have been examined by historians. However, some periods, particularly the twentieth century, need further study as more archival and oral history material becomes available. Revisions of the area's history also should be undertaken to eliminate the pro-Mormon biases frequently present in available studies.

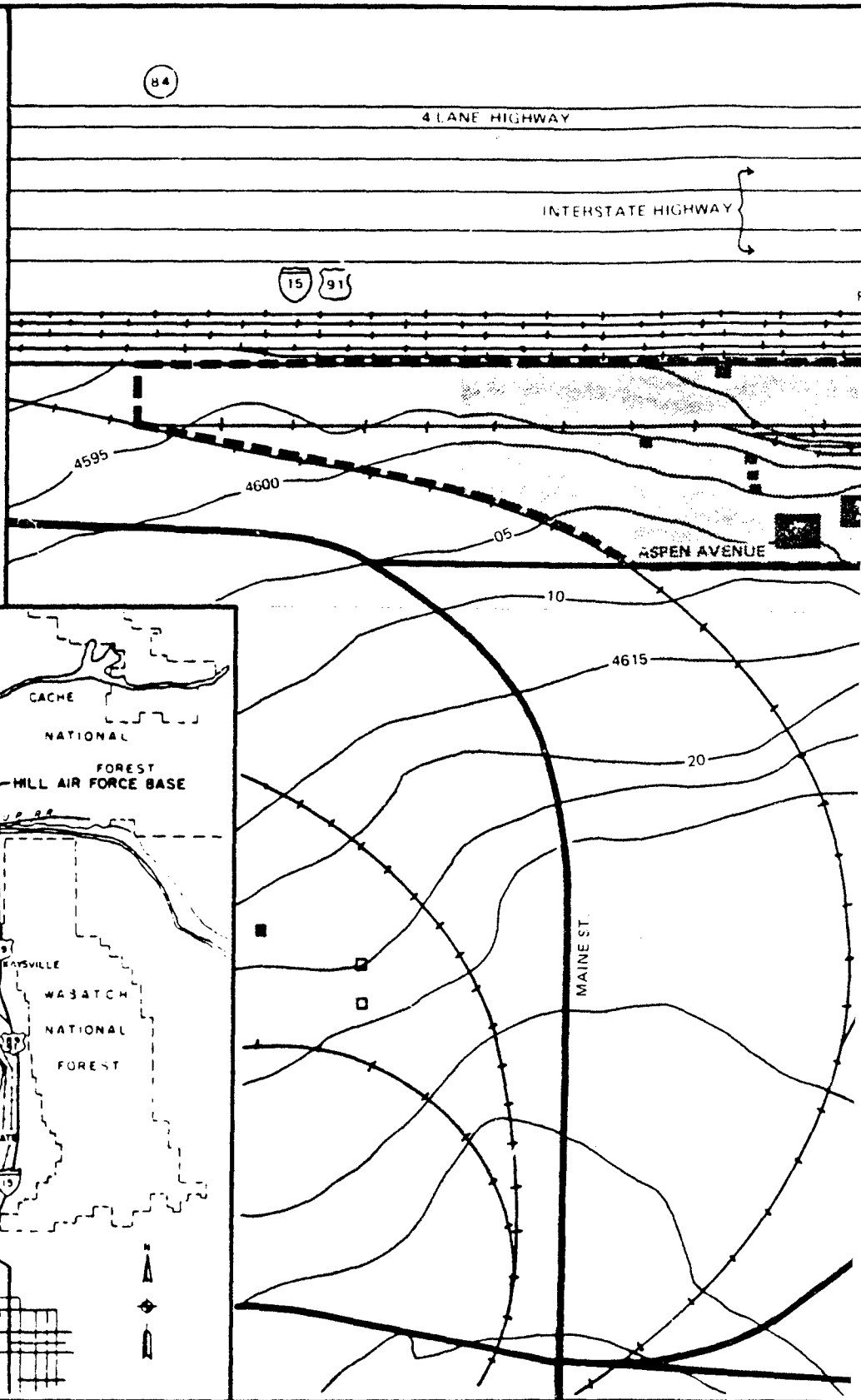
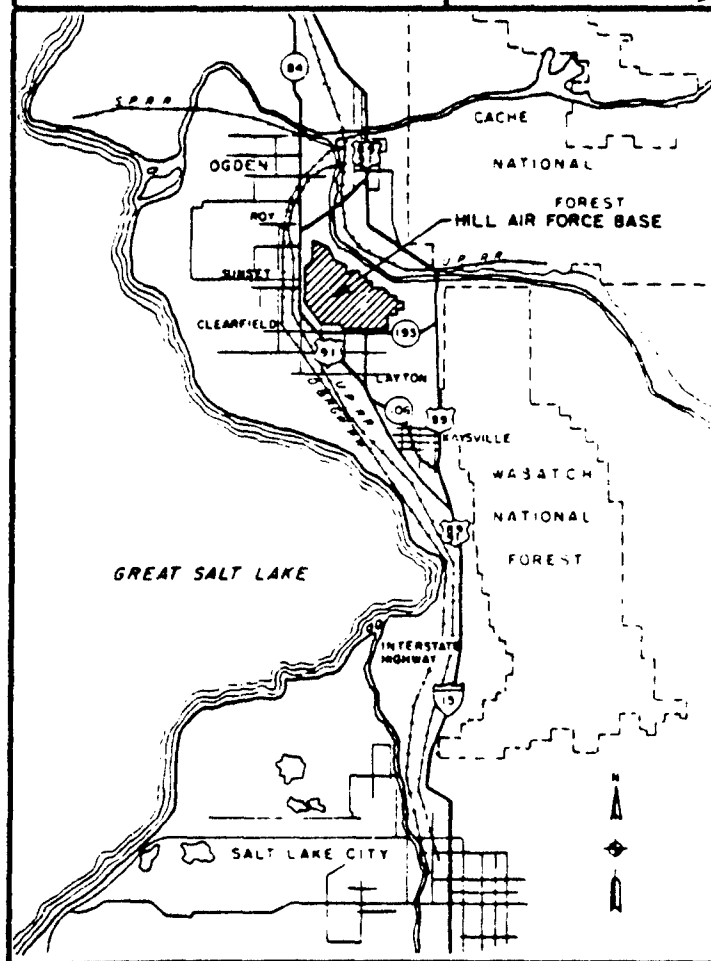
2.3.2 Installation-Specific Archeological Research Directions

The Tooele AD-RR maintenance facility does not have any potential to solve research problems dealing with the prehistoric past. Its value lies in its historic potential (see Figure 2-1).

--- STUDY AREA
BOUNDARY

— AREA OF
POTENTIAL
HISTORIC
ARCHEOLOGY
(STRUCTURES
EXCEPTED)

NOTE LAND USE AND GROUND
DISTURBANCE ELIMINATES
POTENTIAL FOR ARCHEOLOGY.



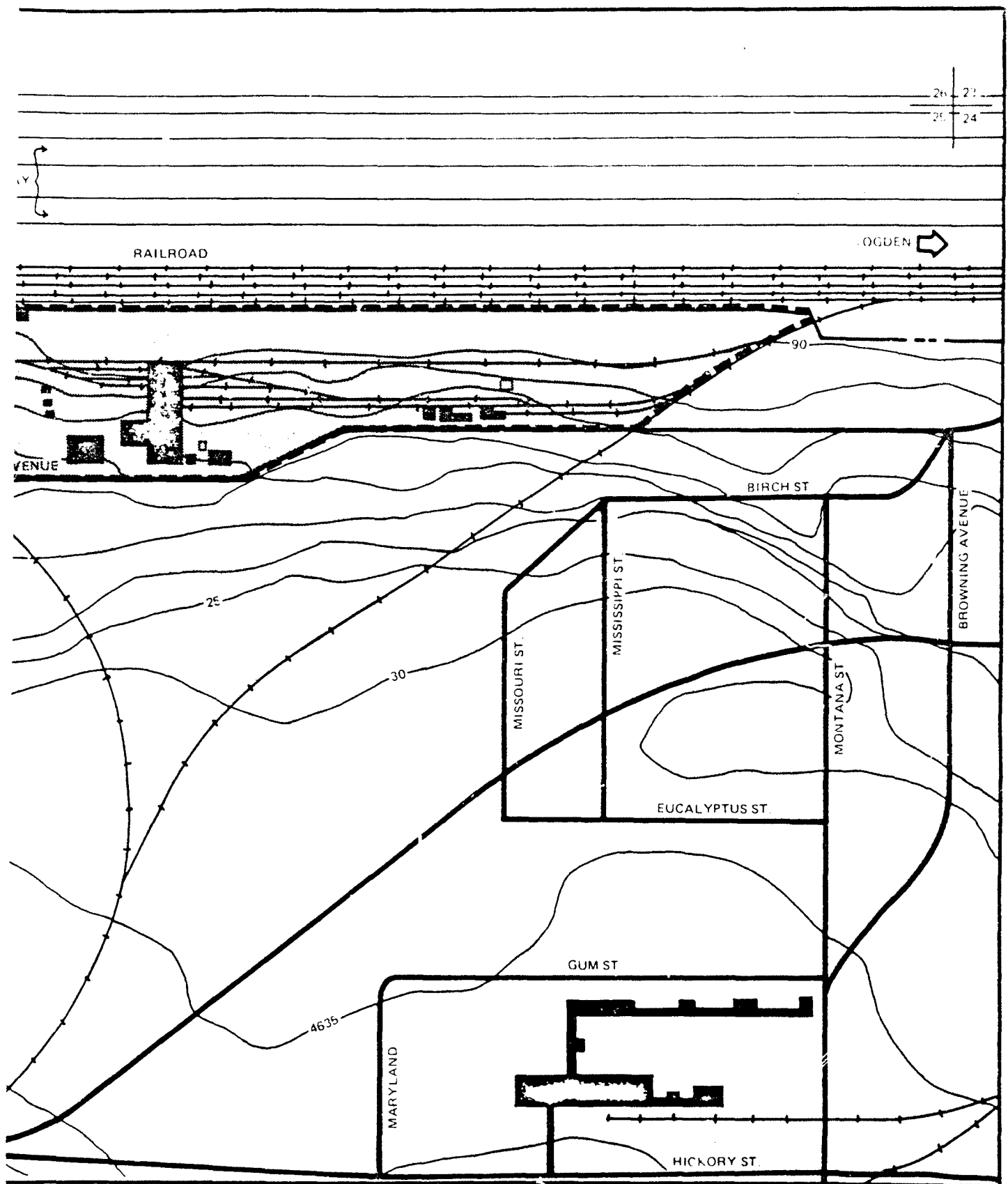


Figure 2-1. AREAS OF POTENTIAL ARCHAEOLOGICAL SITES, TOOELE AD-RR
S-9 MAINTENANCE FACILITY

The extremely small facility size limits applicable site-specific research questions to two:

1. What can archival, oral, and historic archeology sources reveal about the pre-rail shops use of the base lands, especially the purpose/function of the reported foundations and piping that have been discovered during recent construction activity?
2. What can be learned from archival, oral, and historic archeology sources about the U.S. Army's conversion from steam to diesel motive power for their railroads? How was this conversion linked to the 1954 rebuilding of the shops?

CHAPTER 3.0 AN ASSESSMENT OF ARCHEOLOGICAL RESOURCE PRESERVATION AND SURVEY ADEQUACY

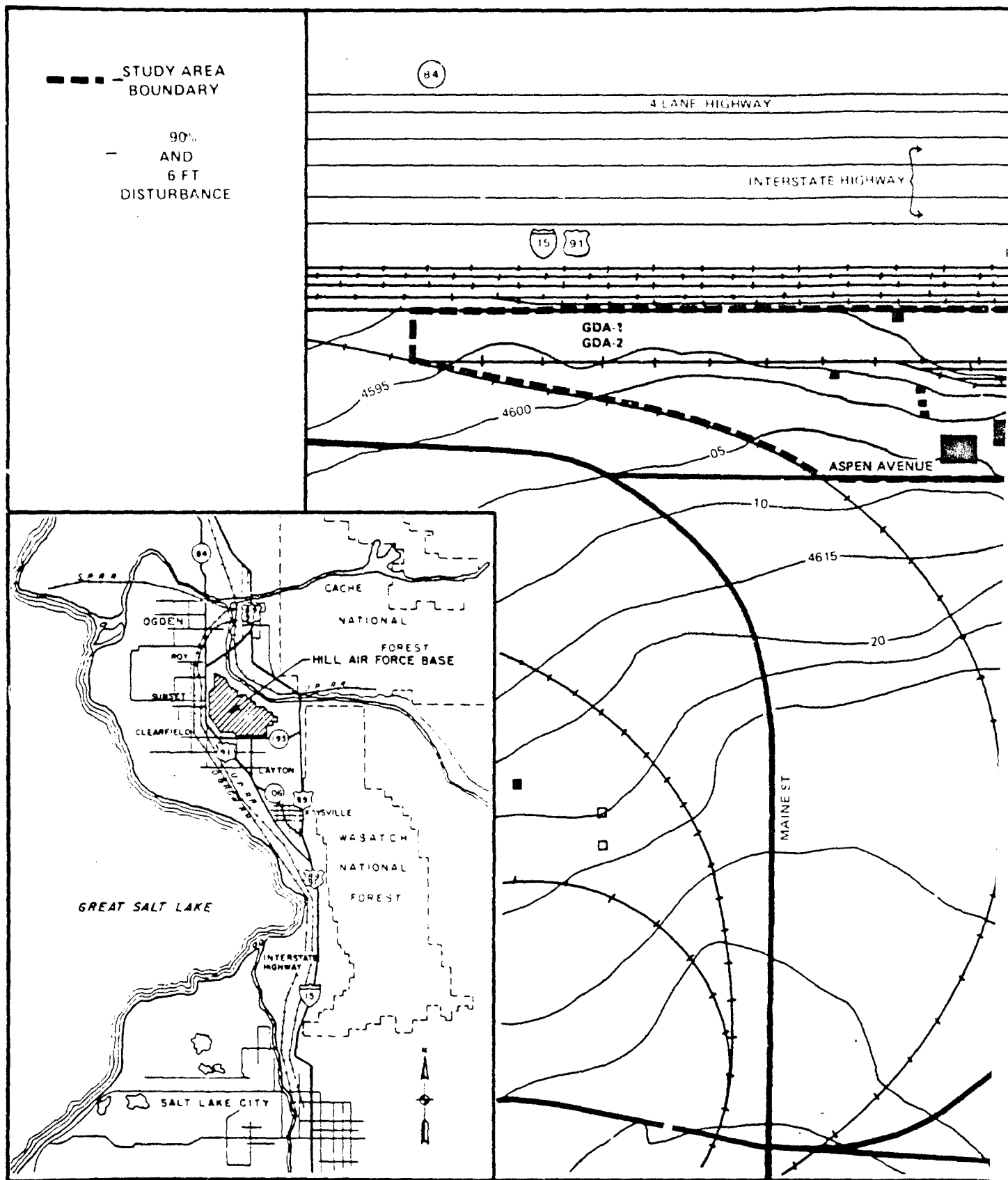
The land that presently constitutes Tooele Army Depot Railroad (AD-RR) Maintenance Facility has been used for two purposes for the last 140 years. Until 1938, grazing and some dryland farming took place on or near the site. This land use disturbed the surface and topsoil to an approximate depth of 12 in. (30 cm). Attendant with these activities was wind and water erosion. However, records do not indicate topsoil destruction approaching the degree experienced elsewhere in Utah, such as the Tooele Valley.

The second major land disturbing activity was the construction of Hill Air Force Base in 1938 and the rail shops in 1942. The laying of foundations, construction of locomotive service pits, and similar activities caused disturbances to a depth of 8 ft. (2.5 m) or more in areas. Grading and building of the rail yards further disturbed the soils, making it very doubtful that any prehistoric cultural resources retain their locational and spatial integrity (Table 3-1, Figure 3-1).

Table 3-1. A SUMMARY OF HISTORIC AND MODERN GROUND DISTURBANCE THAT MIGHT LIMIT THE PRESENT ARCHEOLOGICAL RESOURCE BASE ON THE TOOELE ARMY DEPOT RAILROAD MAINTENANCE SHOPS

GDA No. (a)	Type of Disturbance	Date Conducted (yr)	Reference	Area Disturbed (acres)	Depth Below Surface (ft)	Ratio of Disturbed Total Area	Location of Disturbed Area				USGS Quad Sheet (c)	Coincidental Sites
							UTM(b)		Legal Reference			
							Northing	Easting	Township	Range Section		
GDA-1	Construction of Railroad bed, buildings	1938-42	M.S. History on file at Shops	30	6 to 15	1:1	4554100 4555100	414000 414200	5N	2W 25	R755R	None
GDA-2	Reconstruction/ Remodeling	1954	M.S. History on file at Shops	30	5 to 15	1:1	4554100 4555100	414000 414200	5N	2W 25	R755R	None

- (a) Ground Disturbing Activities (GDA)
 (b) Universal Transverse Mercator (UTM) Zone 12 TUV
 (c) U.S. Geological Survey (USGS) R755R - Roy, UT, 7.5 min (1955) Rev. 1975



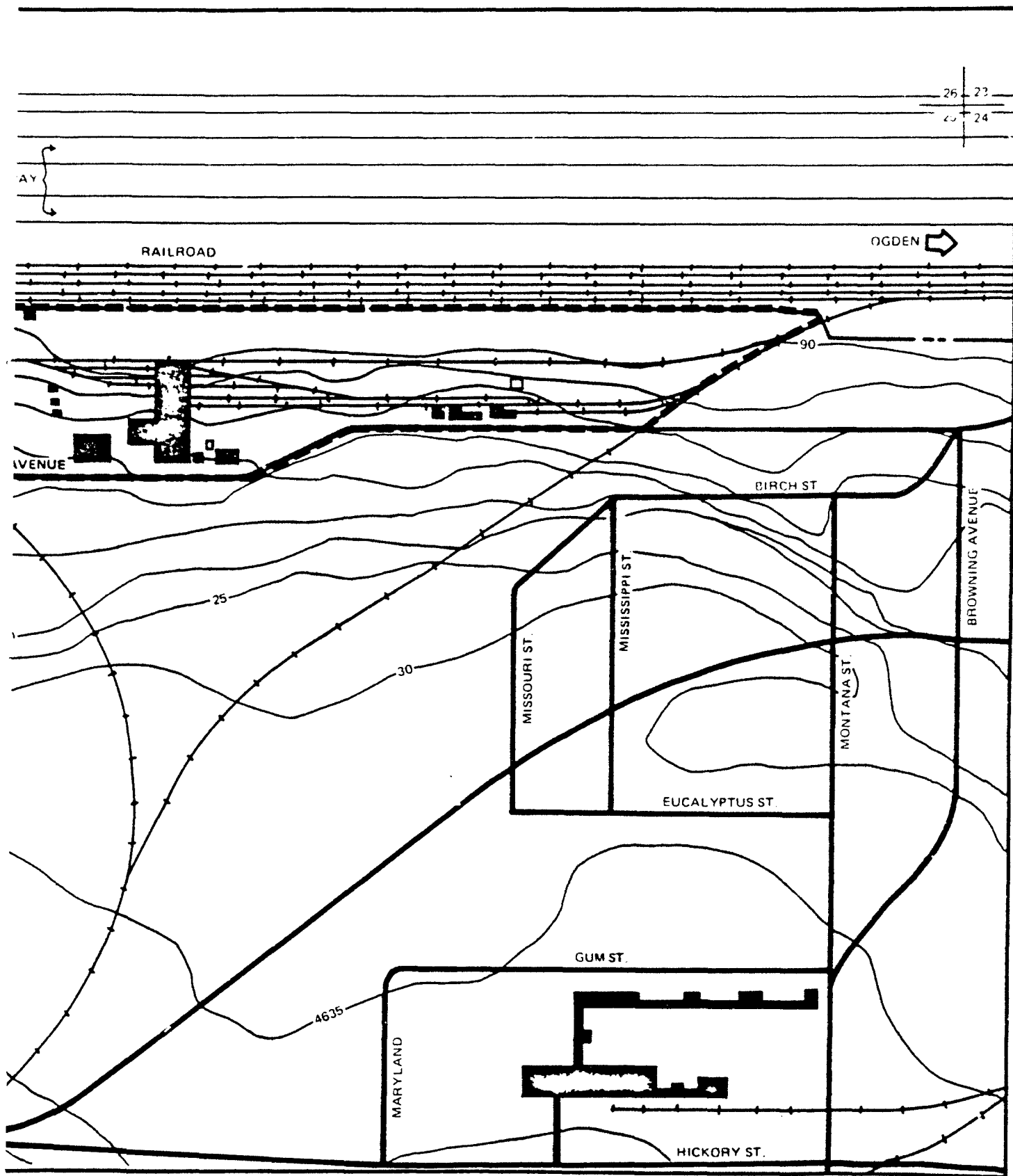


Figure 3-1. MAP OF HISTORIC AND MODERN GROUND DISTURBANCE AT
S-13 THE TOOELE AD-RR MAINTENANCE FACILITY

CHAPTER 4.0 KNOWN ARCHEOLOGICAL RESOURCES ON THE TOOELE
ARMY DEPOT RAILROAD (AD-RR) MAINTENANCE FACILITY

There are no known or potential prehistoric archeological resources on the facility.

CHAPTER 5.0 AN ASSESSMENT OF THE SIGNIFICANCE OF THE
ARCHEOLOGICAL RESOURCE BASE ON THE TOOELE
ARMY DEPOT RAILROAD (AD-RR) MAINTENANCE FACILITY

There are no significant or potentially significant prehistoric
archeological resources on the facility.

CHAPTER 6.0 A RECOMMENDED ARCHEOLOGICAL MANAGEMENT PLAN FOR TOOEE ARMY DEPOT RAILROAD (AD-RR) MAINTENANCE FACILITY

6.1 FACILITY MASTER PLANS

Correspondence from the Hill Air Force Base civil engineer indicates there will be no impact in the area of the Army rail shops. Historical and archeological planning for Hill Air Force Base has been initiated through the Utah State Historical Preservation Officer (SHPO). Correspondence with the Utah SHPO indicates Hill Air Force Base has no major archeological or historical sites on the base.

However, the Base civil engineer states that future requirements will include replacement of 15,000 sq. ft. (1,393 sq. m) of warehouse space, paving of the parking lot for shop employees, and replacement of 10 small outlying shop buildings (personal communication, N.O. Currier).

The engineering technician at Tooele Army Depot reported there are no plans other than on-going maintenance activities for the railroad shops in the Tooele Master Plan (personal communication, Robert Marshall).

6.2 APPROPRIATE GOALS

Figure 3-1 shows the percentage and amount of surface and subsurface damage. There is no potential for intact surficial or subsurficial archeology to a depth of at least 8 ft (2.5 m). However, the area may yield information important in the transition between steam and diesel engines (Research Design 2.3.2). If any subsurface ground disturbing activities are implemented and if subsurface artifacts are encountered, activities should be halted and the Environmental Coordinator must implement the following procedures outlined in the Council's regulations, 36 CFR 800.7 and AR 420.XX:

- When a historic property is discovered during an undertaking, the commander will ask the Secretary of the Interior to study the discovery to see what 36 CFR 800.7 requires. This study should start within 48 hours of the Secretary of the Interior being notified.
- The commander will phone the National Park Service, Washington D.C. to request the study and will send a telegram to confirm the request.
- The commander will advise the SHPO and MACOM (sic) at the same time.
- If the Secretary of the Interior or commander find that the Council should be advised of the find, the commander will request the comments of the Council (36 CFR 800.8(b) (AR 420.XX)).

The appropriate state and federal consulting authorities are found in the main body of the report.

CHAPTER 7.0 SUMMARY

The methodologies used to prepare this overview and management plan consisted of a review of the existing literature applicable to the region and site files in the State Archeologist's Office in Salt Lake City. It also was determined that no documentation exists in the Salt Lake District office of the BLM. The research team also made an on-site inspection of the facility.

The results of this file search, literature review, and on-site inspection revealed that there are no sites on the facility, and because of the degree of land disturbance during construction and subsequent rebuilding of the facility, it is unlikely that any sites exist in the study area. It is felt, however, the facility itself can possibly provide useful historical data on the U.S. Army railroad's conversion from steam to diesel power.

CHAPTER 8.0 BIBLIOGRAPHY

References cited only in the Supplement are given below. All others may be found in the bibliography of the main body of the report.

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